

MOTOR AGE

Vol. XXXIII
No. 26

CHICAGO, JUNE 27, 1918

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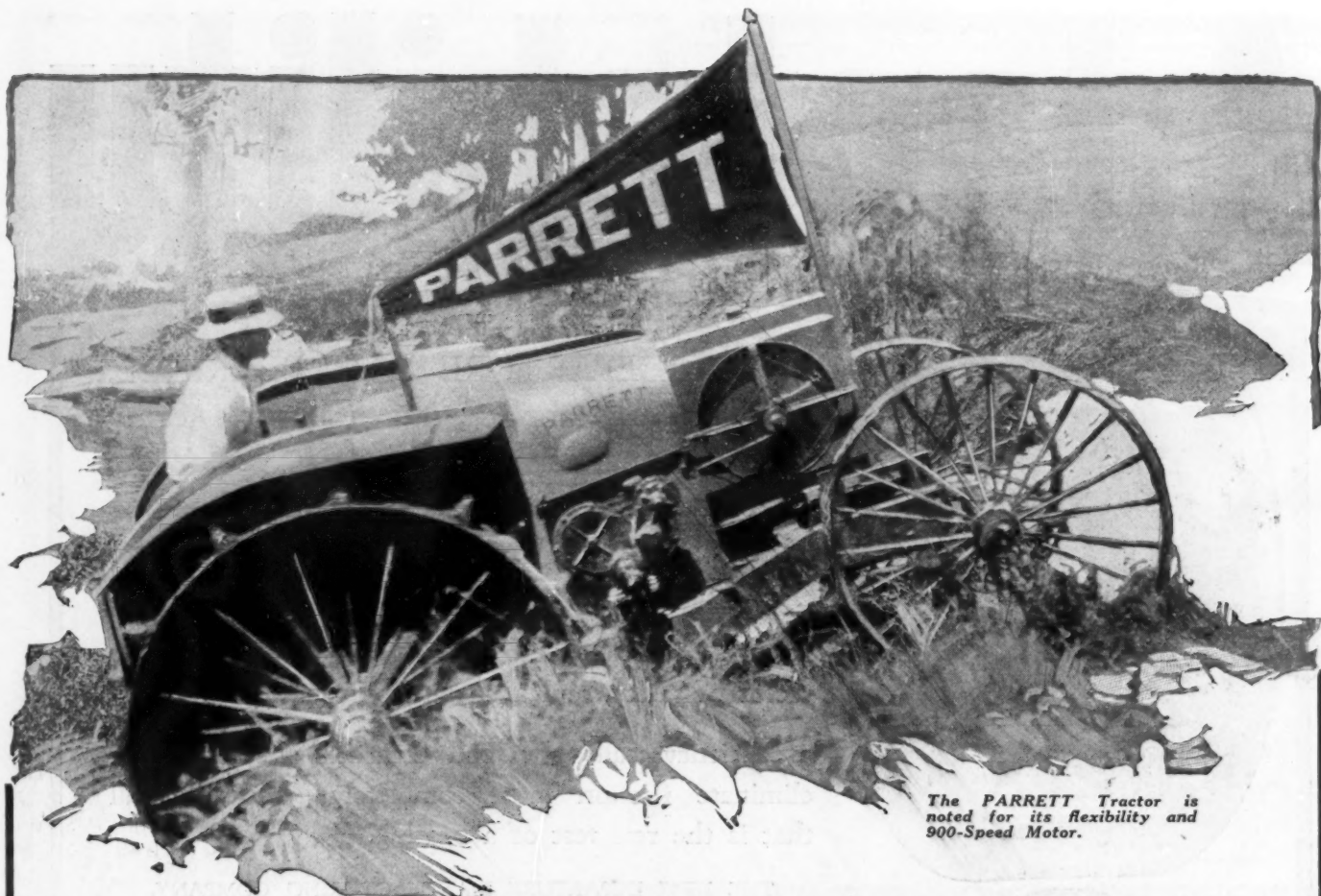
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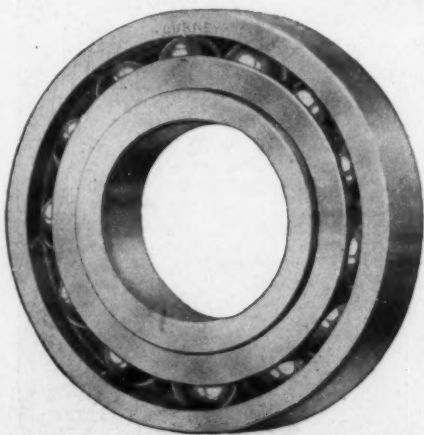
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MOTOR AGE

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Contents

BY AIR ACROSS THE ATLANTIC.....	5
NAVAL AIRCRAFT AFFAIRS ARE COMMENDED	11
EDITORIAL—AMERICA'S AIRCRAFT PROGRESS	14
TO CLASS ROADS BY VALUE IN WARTIME.....	16
AIRPLANES TOO COSTLY FOR GENERAL USE.....	18
MEN BEHIND WAR ACTIVITIES.....	20

An account of the midsummer meeting of the Society of Automotive Engineers at Dayton, with a reproduction of the paper on airplanes read by W. B. Stout, technical advisor of the Aircraft Board.

CHEVROLET VICTOR AT CHICAGO.....	28
SPECIAL TRACTORS FOR BIG GUNS.....	30
ELECTRICAL EQUIPMENT OF THE MOTOR CAR	32
MOTOR DEVELOPMENT	40

The Emerson-Brantingham 12-20 hp. tractor and the Demmler tractor transmission and worm drive described and illustrated.

DEPARTMENTS

READERS' CLEARING HOUSE.....	34
MOTOR CAR REPAIR SHOP.....	39
ACCESSORY CORNER	44
AMONG THE MAKERS AND DEALERS.....	46
FROM THE FOUR WINDS.....	48

NEXT WEEK

Among the features for next week will be the reproduction of the paper by Fay L. Faurote tracing the history of the airplane, which was presented at the Dayton meeting.

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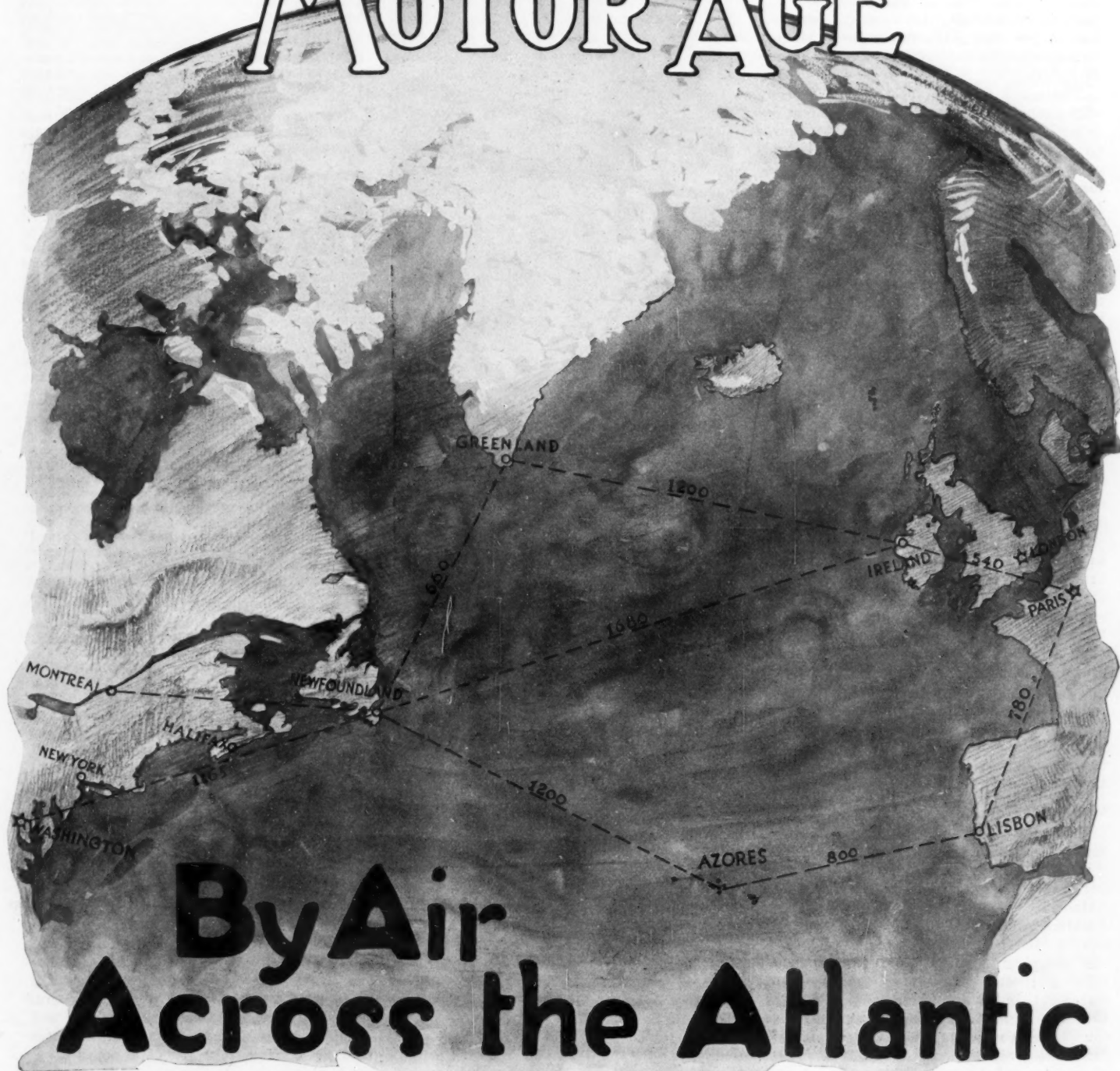
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MOTOR AGE



By Air Across the Atlantic

By Allen Sinsheimer

WASHINGTON, June 21—That an American-built seaplane probably equipped with a Rolls-Royce engine, carrying a navigator, two pilots and a mechanic will leave Newfoundland for Portugal via the Azores on the pioneer flight across the Atlantic ocean in September or October of this year was one of many important assertions made here to-day by Major-Gen. William Brancker, comptroller-general of equipment of the British air council and head of the Royal Air Forces. General Brancker is in this country on a special mission and at the same time to give his

Three routes were considered for the flight across the ocean: From Newfoundland via Greenland; via Ireland; and via the Azores and Portugal. Climatic conditions resulted in the selection of the third route as the most logical

experiences to the new organization heading aircraft work in this country.

The pioneer airplane, stated General Brancker, will carry sufficient fuel for the entire journey. The trip will include 2000 miles, 1200 to the Azores and 800 from there to Portugal. Time consumed

will be less than 40 hr. September or October will be the month witnessing the flight because the best weather obtains then. The Rolls-Royce engine will probably be used, as it is considered more reliable at present than the Liberty engine. Swarms of airplanes, however, equipped with Liberty engines will be flying over the Atlantic within a few months following the first experimental trip.

The hilly lands of the Azores make construction of an airdrome difficult and will require time, hence the first plane will be a seaplane, capable of landing in the har-

bor. The flights taking slightly less than 40 hr. theoretically will use 20 per cent of the first life period of the average engine—200 hr.—but in all likelihood will consume practically between 10 per cent and 15 per cent, since the engines will not be subjected to the strains of either stunts or fighting.

The speed average for the first journey will probably be 95 m.p.h.—85 m.p.h. by engine power with an additional 10 miles by wind power. Flights have been considered by way of Greenland from Newfoundland, by way of Ireland from Newfoundland and via the Azores from Newfoundland. The Azores route has been selected despite the fact that it is several hundred miles farther than the Ireland trip, because the best weather conditions exist there. The three important considerations in making this journey are:

Engine reliability, which we now have in the Rolls-Royce engine and will soon have in the Liberty engine.

Navigation, which has been mapped out.

Weather forecasts, which are a difficult matter but which the meteorological and technical experts are working into satisfactory form.

Seven hundred and fifty horsepower is the minimum required for each airplane for the flights. This will be supplied by using either two Rolls-Royce or Liberty engines, as both of these types are capable of more than 400 hp. Wireless equipment will form a part of each airplane, and several new submarine chasers also equipped with wireless will be scattered over the route so that airplanes in distress can signal for aid.

The first flight will be made with every precaution possible. The plane will probably ride at an altitude of 5000 ft. from which point it can see ships at great distances and with clear weather will observe the Azores at 100 miles distance.

Would Save Shipping

Prefacing his comment on the pioneer flight, General Brancker said:

"An enterprise which must be carried out as soon as possible is the flight of the Atlantic. Once this has been established, America's output of big bombing machines can proceed to Europe by air and so save the shipping that it so invaluable for other purposes. This may seem a wild statement, but we must remember that in 1914 the flight of the English channel was considered a wonderful and dangerous performance. Since then thousands of British airplanes have crossed the channel and but one life has been lost by drowning. There is really no reason why a considerable number of big airplanes and seaplanes should not cross the Atlantic during next summer, and the sooner that a pioneer proves the flight not only to be possible but comparatively safe, the better can the wonderful resources of America be employed toward winning the war."

Secretary Baker and Major-Gen. W. L. Kenly, chief of the Aeronautics Division, interviewed following General Brancker's statement, both expressed keen interest in this matter.

Secretary Baker stated:

"This plan for a trans-Atlantic flight is a very daring and tempting speculation, and anything the War Department can do



A flight over the U. S. Marine aviation field at Miami, Fla.

to help it to a successful conclusion will be done."

General Kenly confirmed the statement that the proposed flight will be undertaken:

"I believe that the psychological effect upon the enemy and upon our own people which would follow a successful flight by an Army or Navy plane across the Atlantic would be far greater if the announcement of the successful accomplishment came as a surprise.

"It is true that we are planning such a test, but I hope that our efforts will receive little if any comment until the feat is accomplished."

In his general discussion of the important features of military aeronautics both in this country and abroad, General Brancker developed many pertinent points regarding which our authorities have made little comment. He spoke in favor of abolition of standardization unless we find the shipping facilities or prove the success of Atlantic flights and hoped that the United States would not confine itself only to the Liberty engine. Germany, he stated, is inferior to England because she has standardized her engines. She has been forced by the size of her frontiers to have more airplanes than England and resorted to standardization, increasing the quantity, curtailing the quality which comes through frequent experiments and change. The flexibility of the English manufacturer has been an important factor, making the English airplanes considerably more efficient in maneuverability than the Boche planes.

The efficiency of our manufacture, said the General, lies not so much in its bulk production as in the high standard of its workmanship and flexibility, by which it can be turned

on to the frequent and inevitable new types which must be manufactured in order to keep the progress in aviation. Great Britain was even more unprepared than America at the beginning of the war. No aeroplane engine had been manufactured in the country and the total output of aeroplanes was probably about 100 a year; these were manufactured either by enthusiastic private designers, who believed firmly in aviation, or by some of the big ordnance firms, who were prepared to lose money in order to keep in line with progress.

On the outbreak of war hardly anyone realized the very important factor aviation would be, and consequently it was impossible to start off on a really big scale and naturally the available resources of the country were needed for the well established services of the navy and army. Lord Kitchener, then secretary of state for war, and Mr. Winston Churchill, First Lord of the Admiralty, were both great believers in the value of aviation and it is to their belief that we owe the comparative rapid progress which was made.

For the first year of the war we had a most difficult task in educating manufacturers to the new trade with the very small experienced personnel available. Our motor manufacturers were optimistic and thought they could make aviation engines as easily as they had made motor car engines, but they soon found that they had made a great mistake, and took them many months to realize the high standard of workmanship and the high quality of material necessary.

It is probably to the flexibility of our manufacturers that we owe our present superiority in the performance of our aircraft over those of the enemy; Germany, by natural inclination and by the necessity of providing a much wider front and consequently a much larger number of aircraft than ourselves, has tended to standardize on a very few definite types of engine and aeroplane and consequently has found it much more difficult to improve and keep abreast of the latest developments in aerodynamical design than we have.

At present we reckon that a well organized plant should be able to arrive at bulk production of a new type of engine within nine months of the order and of a new type of aeroplane within four and one-half to five months; it has been done quicker in both cases.

Standardization of planes has been accomplished insofar as is possible, stated General Brancker. All of the metal parts of the airplanes have been completely standardized but the rest of the planes change so frequently in type that complete standardization is impossible.

Engine Is Limiting Factor

The limiting factor in airplane production is the engine; the planes now are being produced in quantities greatly in excess of the engine production. Large numbers of Liberty engines have been ordered by England from this country for installation in the British planes, and as many will be used as can be shipped abroad. General Brancker expects that several hundred will be shipped this year and also anticipates that he will probably have several thousand planes in storage awaiting engines by Jan. 1, 1919.

The Liberty engine was described in glowing terms. Its performances on British testing fields were called highly satisfactory.

"The present Rolls-Royce engine," said General Brancker, discussing the Liberty engine, "was laid down practically during the first week of the war. The original horsepower asked for was 200 to 250. It took eighteen months even to develop an engine which would fly satisfactorily, and it is only within the last six months that we have obtained an output of the very latest development in this engine.

"So, in spite of all the accusations and disappointments in the American press over the Liberty engine, America has not

done so badly. In fact, she has done very well in producing a completely developed aerial engine *ab initio* in the space of a year. We have watched the test of the engine in France, and it has been tried in England, and the opinion of the British air council is that the engine is a really good sound one, which will be of great value for bombing and reconnaissance work as soon as a few of its infantile troubles are eliminated, and this will be accomplished very soon indeed. The Liberty engine gives a slightly better performance in both climbing and speed than the Rolls-Royce; it is not yet quite so reliable, but there is no reason why it should not be after it has been in general use for a few months and has become really known and understood by those using and manufacturing. We want thousands and thousands of them, but America must remember that the Liberty engine is by no means final and that already there are engines giving far better performances in fighting machines, which must be manufactured if the Allies are to retain their superiority in the air.

"In the first year of the war every type of aeroplane, generally speaking, was used for every type of work, but as the various functions of aviation developed and became clearly defined, different types of airplanes and engines were introduced for the different tasks for which the flying services became responsible. At the present moment we have distinct types for the following different classes of work:

"Corps Reconnaissance. The airplanes which carry out all artillery observation and photographic work.

"Fighter—high altitude—The single-seater fighter of superperformance, which protects the corps reconnaissance and bombing machines and attacks the hostile endeavors at reconnaissance and bombing.

"Fighter—low altitude—The single-seater and, if possible, armored machine, which flies low to attack hostile troops on the ground and keep close touch with the tactical situation.

Other Plane Types

"Fighter Reconnaissance. Usually a two-seater of high performance, which goes far afield over the enemy's lines for reconnaissance purposes or for protection of bombers.

"Day Bombers. A high-performance long-range machine, which usually depends for its safety on the hostile side of the lines by flying in formation.

"Night Bombers. A machine of great lifting power and easy to fly, which is especially suited for night work. And by degrees we must get on to still larger and better types which will carry bombs to the heart of Germany, either by day or night; already, in England, new types are coming on which will do this."

The real reason, according to General Brancker, that the United States has not made single-seater machines is due to the impression that we could secure an ample equipment from the Allies. This impression since has been corrected.

England has developed a new airplane which, said the general, has the biggest spring forward of any machine yet developed. Figures concerning it are withheld from the public. Manufacture is said

to be very simple and tests have displayed wonderful qualities. The machine has climbed to 29,000 ft. in an actual test, breaking all records. It has done better than 140 m.p.h. and is expected to do 150 miles at 3000 ft. altitude. This machine will be used as a single-seater. It is an air-cooled radial-type engine. Its particular merit lies in its maneuverability and speedy climbing qualities.

Pilots for the individual types of airplanes require individual training adapted to the type of airplane they will operate, said General Brancker.

"Each different type of airplane," stated the head of the Royal Flying Forces, "requires specially trained pilots, which renders the whole organization of aviation training an extremely difficult and complicated matter.

"I think it is a generally accepted fact that the British pilot has proved himself superior on the whole to any other pilot on the front and certainly superior to the Germans. From what I have seen of the Americans under training in England they should make magnificent pilots. They



Major General William Brancker is the comptroller-general of equipment of the British air council and a member of the air ministry. In addition to being one of the best versed men on aeronautics on the other side of the water, he is also one of the best flyers in the British Royal Flying Service. He would like to be the pioneer to make the first journey across the Atlantic by airplane, as would three other English flyers

have all the courage, intelligence, dash and earnestness necessary for success in this branch of warfare."

The general warned this country particularly against the practice of giving specific mention to individual aviators:

I have often heard it said that the British are foolish because they refuse to advertise British pilots who have accounted for the greatest number of hostile machines. This apparently obstructive attitude of ours may give other people the wrong impression that our pilots do not shoot down so many Boches as those of our Allies, but this is absolutely not so. We have pilots who individually and single-handed have destroyed as many German aeroplanes as any one else; in fact, I think if it was worked out on paper our average would be higher, but our air authorities from the very start have set their faces steadily against the booming of the star flier, who is sufficiently lucky to be in a fighting squadron, at the expense of the man who spends hours and hours under heavy anti-aircraft gun fire and harassed by the attack of the enemy fighters whilst he carries out close and accurate observation for our artillery and takes countless photographs for the use of our generals.

It must be remembered also that any undue advertisement of the air service would inevitably render that service unpopular with the heroes in the infantry and artillery, who lie for days and nights in the mud under an overwhelming and crushing hostile fire and whose names are never mentioned except in periodical lists of honors and awards.

The training required to meet modern conditions of warfare is just about six times that which was considered sufficient in 1914, and it is a well proven axiom that the better trained the pilots, the fewer the casualties on the front.

From statistics we have clearly proved that much the largest proportion of casualties occur during a pilot's first month's real work over the lines.

In England we have insisted on a very high standard of training, which has undoubtedly delayed our output of pilots in numbers, but on the other hand has given us pilots who are very considerably superior in their training to those of the enemy and I think it is to this fact that we largely owe our present superiority.

The most interesting recent developments in aviation, said General Brancker, include the low-flier, the defense of London by night by aerial fighting, the aerial anti-submarine patrol and the attack of Germany by air.

Armor for Planes

The use of low-flying machines, preferably armored, is growing considerably. The rumors of tank airplanes and armored airplanes, are said to be chiefly unfounded, although such planes will probably appear in the near future. England is now working out some highly armored low-flying airplanes which will have the required maneuverability. Both the gas tanks and the pilots will be armored, preference in armor being given in every instance to the gas tanks so as to prevent fire. Many of the rumors of armored airplanes have been caused by fliers with poor marksmanship who attributed their inability to hit the enemy to armor.

Discussing the low-flier airplane, General Brancker said:

"For the past year the use of airplanes to keep close touch with the tactical situation and to attack troops on the ground by means of flying at low heights down to even 200 ft. has steadily developed and aircraft has been very freely used for this purpose during the retirement of the British army toward Amiens, as many as 240 British airplanes being concentrated at one point flying low over a massed hostile advance. They caused very large casualties and completely disorganized the German

movement. There is no doubt that this form of air fighting is going to develop considerably in the future."

The best means to combat airplanes bombing London by night is by sending airplanes against them. Anti-aircraft guns and deceiving lights are poor weapons, said General Brancker, and the planes attacking London are best fought by single-seater machines.

"During the last attack on London," he said, "on the alarm being given seventy to eighty fighting airplanes ascended to heights varying from 18,000 ft. downward and flew about ready to attack the Boche when he arrived. All around the eastern area of London are illuminated landing places to guide these airplanes when they have to descend and a good system exists for directing them to the areas in which the hostile aircraft are reported to be moving. The result in the last raid was that of thirty hostile aircrafts which crossed the British coast six were certainly brought down by our airplanes and probably a seventh and our total casualties were one machine smashed and one pilot with his leg broken."

Submarines sink no ships in those vicinities guarded by aircraft according to General Brancker.

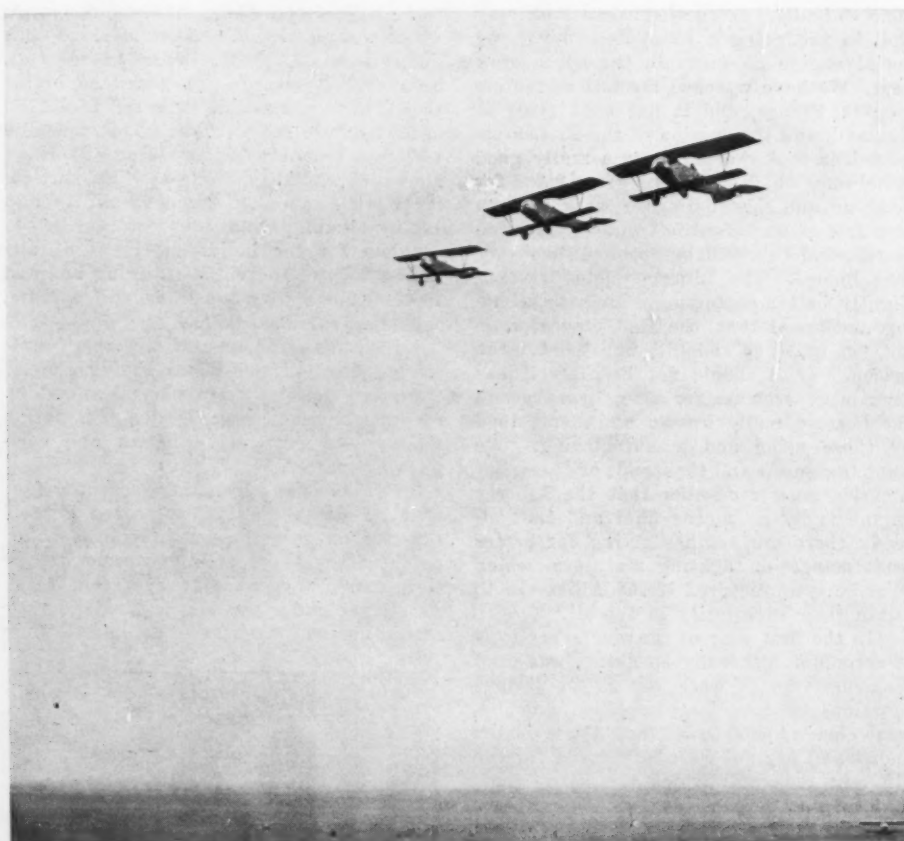
"A definite system of patrol now exists around the whole coast of Great Britain and France by means of seaplanes and airplanes, the big seaplanes going far out to sea, and the airplanes dealing with the zones closer to the shore. The sight of aircraft usually sends the submarine down as far as he can get at once, but in a good many cases during the past year, submarines have been caught and destroyed by bombs. America is taking a very large part in this form of warfare and has placed very large resources from her naval air service at the disposal of both France and ourselves," said General Brancker.

"The attack of Germany by the air has now definitely started and will grow steadily in volume and efficiency. By degrees all the vital points will come within our reach. Germany is far seeing. She no doubt anticipated that America's entrance into the war would increase air fighting and is preparing. London, Paris and Berlin will no doubt be hammered, and the winner will be the one who hammers hardest. We have no doubt we will hammer hardest."

Depreciation Averages

Wastage, which includes depreciation through all causes, averages, said the general, from 64 per cent for some types to as much as 114 per cent for others in the course of each thirty days. This, he stated, renders the maintenance of such a number as 100,000 machines entirely impossible.

This matter of wastage is also a confusing one because the various armies use different methods of maintenance. In some instances where a squadron claims to have 100 machines, it makes no allowances for wastage and inspection often shows as many as 50 per cent out of service. The British Royal Flying Service observes a plan for maintaining the airplanes of each squadron which provides that 50 per cent of the airplanes are reinforced by extra



An American trio performing aloft for Secretary of War Baker's party on its visit to the Western Front

engines available at the shops behind the hangars. By this and other means when a squadron announces that it has 100 airplanes ready for service, it means that at least 90 per cent are ready at a minute's call while the other 10 per cent can be ready within 2 or 3 hr.

Discussion of guns developed that the Germans and the French have both attempted to use a gun shooting through the camshaft, but it has been found impractical because it fires but one shot at a time. At present the machine gun is being used, but England is working, as is the United States also, upon a machine gun that will fire thousands of shots per second and will operate through the camshaft.

The numerous reports of enemy aircraft brought down are not always reliable, according to General Brancker, who told how the aviators, and especially the new ones, are deluded into believing they have achieved a victory when they witness the enemy fall. The fall is often only a spin drop made to get away. An interesting example was that of a young pilot on his first trip. He saw the Boche drop from 5000 ft. over French soil and rushed his airplane to the hangar, jumped out and hurried to take his prisoner. Instead he met an irate major who told him that the Boche had dropped to 100 ft., straightened out, killed twenty horses with bombs and departed for his own lines.

Describing the administrative side of British aviation, General Brancker told of the numerous convulsions and crises that have occurred. Since 1914 there have been three different administrations. The first was the combination of the Royal Flying

Corps, Naval Flying Corps, Military Flying Corps and a separate organization called the Royal Naval Air Service. Each of these different organizations, though loosely joined, competed with manufacturers for aircraft, creating great confusion. There was overlapping, friction and waste of effort. A new air committee under Lord Derby was formed but lacking real power it faded from existence.

English Air Progress

"In May, 1916, the first air board was formed under Lord Curzon charged with certain definite functions and called on to make a definite report toward recommending future developments after sufficient experience had been gained. This air board came to an end at Christmas, 1916, on the fall of the Asquith government and a new board with greater powers was formed under Lord Cowdray. The novel feature of this organization was that the whole of aeronautical supply, both naval and military, was placed under the minister of munitions and a director-general of aircraft production was created in the ministry, who was ex-officio a member of the air board," said General Brancker.

"Lord Cowdray's air board endured for almost a year. It did very good work and proved conclusively that an air minister was necessary if aviation was to have the power and receive the consideration due it as one of the most important factors in modern warfare. As a result of the work the present air ministry was created last Christmas with Lord Rothermere as air minister, he being replaced last May by Sir William Weir, who had formerly been director-general of aircraft production in the ministry of munitions.

"The Air Ministry is controlled by an air council consisting of the secretary of state, an

under-secretary of state, the chief of the air staff, who is responsible for aerial policy and organization, the master general of personnel in charge of recruiting and training and the comptroller-general of equipment, responsible for acceptance, test, storage and delivery to service units of all aircraft and parts and accessories and for the housing, feeding and clothing of the personnel, and the administrator of works and buildings, responsible for erection and maintenance of aircraft stations. Besides this, the director-general of aircraft production in the Ministry of Munitions is ex-officio a member of the air council and in a way serves two masters.

"This new organization is proving a great success and will undoubtedly endure. For the first time it has been possible to think of aerial warfare and undertake a great aerial warfare offensive, the results of which may be compared with the results obtained by the army and navy.

"On April 1 the Royal Air Force came into being and the Royal Naval Air Service and the Royal Flying Corps were merged into one.

"Since the start of the great German offensive in March we have had perhaps a greater measure of superiority in the air than ever before. During one week in March 132 Boche aeroplanes were driven down by ours and absolutely crashed, eighty-eight others were driven down out of control and many must have been killed or wounded or so badly knocked about that they also crashed on landing. Six were brought down by infantry and anti-aircraft fire, whilst only forty of our machines were missing, although, of course, a certain number in addition fell on our side which we do not mention specifically, and a good many pilots were wounded or had their machines very badly shot about.

Limit to Expansion

"Great Britain is going on expanding her Royal Air Force, but there are limits and when we reach them we shall only be able to replace wastage and keep pace with the production of new types which will always be necessary.

"America has a wonderful opportunity of pushing the advantages of aerial supremacy to the utmost, but her manufacturers must realize that the progress of aviation has been very rapid and will be very rapid, and that therefore they must face continued interruption in standard production in order to produce aircraft of higher and higher quality and performance.

"At the beginning of the war we sent just over sixty aeroplanes with the British Expeditionary Force to France, and there were a few seaplanes and aeroplanes working for the Admiralty on coast defense. The general belief at that time was that the war would be over very quickly, so that practically all the efficient machines and efficient pilots available were pushed off to the front, and the training resources at home cut down to the minimum. Thus from the beginning of the war we had to face the program of keeping up wastage in France and developing further squadrons and a big organization at home from practically nothing at all. America has had the great advantage that she had no responsibilities overseas until quite lately, and that all her energies and resources have been devoted to creating a large organization from the start.

"The progress of aviation during the last four years has been little short of marvelous and there is no reason why its progress during the next four years should not be equally so; every day its importance as a factor toward ending the war increases and it is a branch of warfare in which the Allies should be able to make far

more rapid progress than the Germans, whose material resources are far more restricted and whose pilots can never be as good as ours in the air.

"In a few years the possibilities of aviation as an instrument of war are so appalling that it may force civilized nations at all events in Europe to agree to abandon war amongst themselves forever. War has been the making of aviation; let us hope aviation may be the destruction of war."

N. A. D. A. COMMITTEE TO CAPITAL

St. Louis, Mo., June 24—A committee representing the N. A. D. A. will appear before the Ways and Means Committee at Washington Wednesday of this week to discuss all matters pertaining to tax of motor cars, gasoline and accessories. The appointment was obtained from Chairman Claude Kitchin of the committee by President F. W. A. Vesper following a discussion of the situation by the motor car dealers in Chicago a week ago.

President Vesper took the question of a hearing up with Chairman Kitchin and on Thursday received notice that the motor car dealers would be heard June 26. The following are to be present: F. W. A. Vesper, president N. A. D. A., St. Louis; E. E. Peake, membership secretary N. A. D. A., Kansas City, Mo.; Walter D. Meals, Cleveland, Ohio; E. W. Steinbat, Indianapolis, Ind.; H. B. Harper, Philadelphia, Pa.; C. C. Coddington, Charlotte, N. C.; N. A. Reddick, Scotland Neck, N. C.; H. C. Finchel, Winston-Salem, N. C.; J. S. Donavan, Boston, Mass.

OIL PRODUCERS ARE "ESSENTIAL"

Washington, June 21—Oil producers will be considered vitally essential by the War Industries Board when deciding priorities of steel shipments. Fears on the part of the oil industries that it would not be classed as essential have been dissipated by a letter from the U. S. Fuel Administration to the National Petroleum War Service Committee.

EXPORT RESTRICTIONS MODIFIED

Washington, June 21—Export restrictions as to passenger cars and motorcycles with spare parts, not including tires or accessories, have been modified by the War Trade Board. This is expected to do much to destroy the commercial relations between Germany and the European neutral countries as well as to have an excellent effect on America's trade balance and the rate of exchange.

Holland and Denmark are mentioned spe-

cifically as countries to which the articles can be exported under license. The plan is much broader, however, and it is reported unofficially that an understanding has been arrived at with Switzerland, Spain, Sweden and Norway whereby they also are to receive the commodities listed.

It is understood also that favorable consideration will be given to applications for license to export the listed commodities to South America, if tonnage is available and it is shown that the articles are not demanded by the war program of the United States or Allies. Ships bringing nitrates and other war necessities to this country from South America may carry such cargoes on their home trips.

MOTOR RENTAL AT COST PLUS

Washington, June 21—The rates for renting motor cars, motorcycles, traction engines and motor trucks by Government contractors under the cost plus system is shown in the cost plus regulations to be as follows:

Automobiles	\$2.00 to \$ 8 per day
Traction Engines....	2.00 to 15 per day
Motorcycles .....	.25 to 1 per day
Motor Trucks	1.00 to 25 per day

Fuel, lubricants and labor are not included.

MOTOR CARS TO CARRY MAIL

Washington, June 21—Daily motor car parcel post service between New York and Worcester, Mass., will be started July 1. When a bad stretch of road between Waterbury and Hartford, Conn., has been put in shape, the route will be extended to Portland, Me. Repairs to this road are scheduled to be completed by July 15.

Stops will be made at Danbury, Conn., and Springfield, Mass., and other points along the line. With the New York-Portland service started, parcel post trucks will be in operation in connecting links over a continuous route between Portland and Warrenton, Va. Truck service between New York and Washington already is in operation. Further extension southward will be made as soon as cars can be secured.

QUICK COAL REPORTS ASKED

Washington, June 21—All industries or concerns using 500 tons of coal or more annually are urged by the United States Fuel Administration to promptly fill in the questionnaire which has been sent to them. The purpose of the questionnaire is to establish without dispute the industries entitled to places on the preference list. These industries will be served with coal in sufficient amounts to care for their current requirements before distribution is made to other consumers.

The preference list already established by the War Industries Board is being reclassified to maintain degrees of preference. The first degree of preference already has been determined and includes railroad fuel, steamship bunkers, exclusive of pleasure crafts, and by-product plants. The second, third and fourth degrees of preference are for the present being considered as one group, and no differentiation will be made between them until the complete re-classification has been made.

ARE YOU ONE OF THE "HICKS"
WHO STILL SAYS
"PLEASURE CAR"
WAKE UP!—SAY
"PASSENGER CAR"
DON'T BE A
RIP VAN WINKLE

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Enough Gas for All with Rational Care

Conservation During Next Three or Four Months Urged Without Government Action

WASHINGTON, June 22—There will be sufficient gasoline for war, passenger car and all ordinary purposes if rational conservation is practiced by the public. The gasoline situation is by no means considered acute at present by the Fuel Administration. Transportation troubles and increased needs of the armies in Europe make conservation of gasoline during the next three or four months, when consumption is at the highest point, necessary; otherwise, the situation is unchanged. There has been more than enough gasoline to meet all requirements of gasoline so far.

There is no thought at present of curtailing the use of passenger cars on Sunday or any other day or the issuance of gasoline cards to limit the amount to be sold to each owner. However, to set at rest the wild rumors, such as these, that have been current, W. Champlain Robinson, director of oil conservation for the Fuel Administration, plans to co-operate with the motor car industry and National Petroleum War Service Committee in determining the most satisfactory method of gasoline conservation.

The production of gasoline in 1917 was 65,000,000 bbl. of 42 gal. each. During the first quarter of this year the production was 17,384,000 bbl., as compared with 13,700,000 bbl. for the same period of 1917. April 1 there were 12,500,000 bbl. of gasoline in storage. All of which makes the outlook anything but discouraging.

It is expected that conservation by the public will render Government action unnecessary.

FUEL FOR CEMENT MAKERS

Washington, June 21—Cement manufacturers will be given preferential treatment by the Fuel Administration to allow them a reasonable supply of fuel. The manufacturers have agreed to curtail their operations to the point where production will be only sufficient to meet direct and indirect war requirements and the demands of national or exceptional importance. A

conference was held here to-day, which resulted in the agreement.

Asphalt has been placed upon the Restricted Import List by the War Trade Board. Imports for the calendar year 1918 will be limited to a total quantity of 62,000 tons, 30,000 tons from Venezuela and 32,000 tons from the Island of Trinidad. All outstanding licenses for the importation of asphalt are revoked for shipments after June 15, 1918.

Allocation of the amounts permitted to be imported, regulation of the price and other details will be arranged after conference between the War Trade Board and the War Industries Board.

FORD CHASERS THIS MONTH

River Rouge, Mich., June 21—Production of submarine destroyers at Henry Ford's plant, west of Detroit, will begin this month. The huge plant has been erected in slightly over 100 days, and everything is in readiness for the launching of the first boat. According to present plans one complete submarine destroyer will be made each day at the plant.

OVERLAND IN FULL SWING

Toledo, Ohio, June 21—Willys-Overland Co. is now in full swing on the four large contracts and a number of smaller ones it has accepted from the Government. The first contract was through the Toronto plant, with the British government, for 1000 Sunbeam airplane engines. A quantity of these engines has been manufactured and accepted, and actual deliveries are coming along rapidly.

The second large contract was for 5000 eight-cylinder training engines, for use in training planes at the several cantonments already established in this country. To take care of this contract, three buildings were constructed at Elmira—an assembling plant, testing plant and a take-down and reassembling plant. On this contract 835 engines were delivered in March and 1003 in April. During May and June, according

to contract, 1000 will be delivered each month. Large orders have been received for parts for these training engines, on which deliveries are being made from the Elyria plant.

The third large order was taken by the Toledo plant for approximately 3000 gun carriages, deliveries of which will begin in June in small numbers and increasingly larger quantities thereafter monthly.

The fourth contract was for machining large shells. The contract will amount to about \$10,000. A special department has been created for this shell business, the same as for the gun carriages.

The manufacture of motor cars will be continued in reasonable quantities.

RUBBER MAKERS PROTECTED

Washington, June 21—Importation of manufactured rubber articles is prohibited after June 25. This ruling by the War Trade Board follows restriction of the importation of crude rubber ordered recently to save ship tonnage. It will prevent unfair competition on the part of foreign manufacturers who were preparing to ship quantities of rubber tires and other rubber products into this country, this taking much of the domestic manufacturers whose allotments of rubber have been reduced. The ruling applies to all manufactured goods wherein rubber is the principal constituent.

Articles containing rubber weighing not more than 5 per cent of the total weight of the article may be exempted from the restriction.

FISHER EARNS \$4,352,078

Detroit, June 21—Fisher Body Corp. net earnings for the year ended April 30, 1918, were \$4,352,078, as compared with \$2,876,407 in the preceding year. A surplus of \$2,854,482 remains after deducting interest and taxes. This is an increase of \$75,673, or 2½ per cent.

NEW ORDERS FOR FORDSONS

Dearborn, Mich., June 22—Henry Ford & Sons have received more orders from states desiring tractors. A joint order has been placed for 1000 Fordsons to go to Maryland and Delaware. Deliveries have not yet started on this order. New York has ordered 1000, of which 155 have been delivered. North and South Carolina each



Fiat has furnished many thousands of the trucks to the Allied armies, driving them to the Western front from Italy. Here a group is shown in a motor park awaiting distribution to the armies

have placed orders for 100 tractors; these orders will be completed within thirty days.

Only one distributor is provided for the entire New England section. D. W. Flint, Providence, R. I., has delivered 102 tractors and has orders for 200 more. One thousand will be delivered in this section. The Canadian delivery is now seventy-three tractors beyond its contract, and Ford has orders for several more. It is believed the total will be 1129 before the contract is closed. Of the 100 tractors ordered by Cuba thirteen have been delivered. Seven Fordsons have been shipped to South America. Deliveries to Ohio, Wisconsin, Iowa and Virginia are nearly completed. It is believed final shipments will be made about July 8.

GIRL'S WORK COMMENDED

New York, June 22—The work of Christian Girl in handling truck production for the Quartermaster's Department of the U. S. Army was the subject of the resolution passed by the executive committee of the Motor & Accessory Manufacturers' Association at its meeting last Friday. Mr. Girl resigned from the Washington work some time ago to continue his work as president of the Standard Parts Co. of Cleveland. After the usual preamble the resolution concludes:

"Be it resolved that it is the sense of the executive committee of the M. A. M. A. in behalf of the entire membership that it is under deep and sincere obligation to Mr. Girl for his splendid and patriotic work, for his zealous and unselfish protection of the interests of the U. S. government as well as the interest of the manufacturers of motors, parts and accessories and that a vote of thanks be extended to him in appreciation and that an engrossed copy of the resolution be presented to him."

M. A. M. A. DEALERS AT CHICAGO

New York, June 22—The Motor & Accessory Manufacturers' Association, through its executive committee, has ruled that an exhibit of motor car accessories in connection with the Chicago convention of the National Association of Automobile Accessory Jobbers by its members is permissible in that the proposed exhibit does not come within the jurisdiction of the M. A. M. A. This means that any M. A. M. A. member can exhibit without violation of the show rules. It is understood that the exhibition is not open to the public but rather intended for the jobbers and that no admission is to be charged and consequently no profit will come from the exhibition.

The show committee of the M. A. M. A. was instructed to take up with S. A. Miles the matter of accessory manufacturers participating in the New York and Chicago national shows in 1919.

DROPPED GLASS BRINGS FINE

Akron, Ohio, June 21—The dropping of several large glass bottles on the pavement in this city recently cost a man \$15 in the police court. The driver of a toilet water company dropped eight 1-gal. bottles at the business intersection of the city and made no attempt to clean up the street afterward. On complaint of the Akron Automobile Club the arrest followed.

Naval Aircraft Affairs Are Commended

Committee Finds Construction Work Performed Satisfactorily—Liberty Engine Helped

WASHINGTON, June 21—The committee of the House of Representatives appointed for investigation of conduct and administration of Naval affairs has commended the Naval aircraft construction work performed. That part of the report bearing upon aircraft reads as follows:

We have examined the naval aircraft situation and find many matters of great interest, but much of our information is not now open for public discussion.

This was the one development of material which no amount of foresight would have enabled the Navy to prepare adequately. The growth of airplanes and hydroplanes has been so rapid that nothing short of actual war conditions would insure a large number of up-to-the-second machines with aviators trained to handle them.

In the earlier stages of its undertaking the naval air service met many discouragements, but the perfection of the Liberty motor and the use of large sums of money in conjunction with the Army to finance manufacturers have, under the direction of the air service, produced results that now promise to meet the requirements of this important branch of the Navy.

The aircraft program is in charge of Capt. Noble E. Irwin, and we commend to the entire committee the careful reading of his hearing, and especially a recent interesting and informing report made by him, now on file with the secretary of the committee.

The report filed by Captain Irwin with the committee is not available for public information because of military reasons. The hearing of Captain Irwin by the Committee on Naval Affairs developed the following information:

The Navy Department considers it undesirable to build more rigid dirigibles and is manufacturing only the non-rigid types made of cloth, inflated like a balloon and without metal or woodwork. The fuselage of the car attached to this type is like the fuselage of a War Department airplane.

The rule in connection with establishment of training schools for flyers is to

limit it to ninety machines because more than that number creates great possibilities of collisions in the air.

The advanced training schools are separated from the preliminary training schools and include instructions in bomb dropping and gun fire.

The sizes of the airplanes change so frequently that new hangars frequently have to be constructed.

NO QUAD ROYALTIES

Kenosha, Wis., June 24—There has been much speculation concerning the manufacturing arrangements of the Nash Quad for military purposes by which several concerns, namely, Hudson, Paige and National each are building 2000 Quads for military use. G. W. Nash, president of the Nash Motor Co., has given to the United States government the right to build the Nash Quad without royalty and in any quantities necessary for the period of the war. In addition to this the Nash company has furnished free of cost to different concerns manufacturing the Quads the necessary working blueprints and is furnishing all the information by way of revisions to these blueprints without cost. G. W. Smith, who has been connected with the engineering department of Nash, is giving all his time assisting these concerns in the manufacture of the Quads. It is expected that all three companies will be in production by July and the 2000 output from each should be completed soon after Jan. 1.

Several outside concerns are assisting in the manufacture of the parts for these jobs. Axles are being manufactured by Timken, Columbia and Salisbury. Transmissions are being manufactured by Brown-Lipe and the Haynes Automobile Co. Engines are being manufactured by Buda and Haynes. M & S type of differential is being manufactured by Brown-Lipe-Chapin and M & S Corp. Lavigne is manufacturing the steering gears.

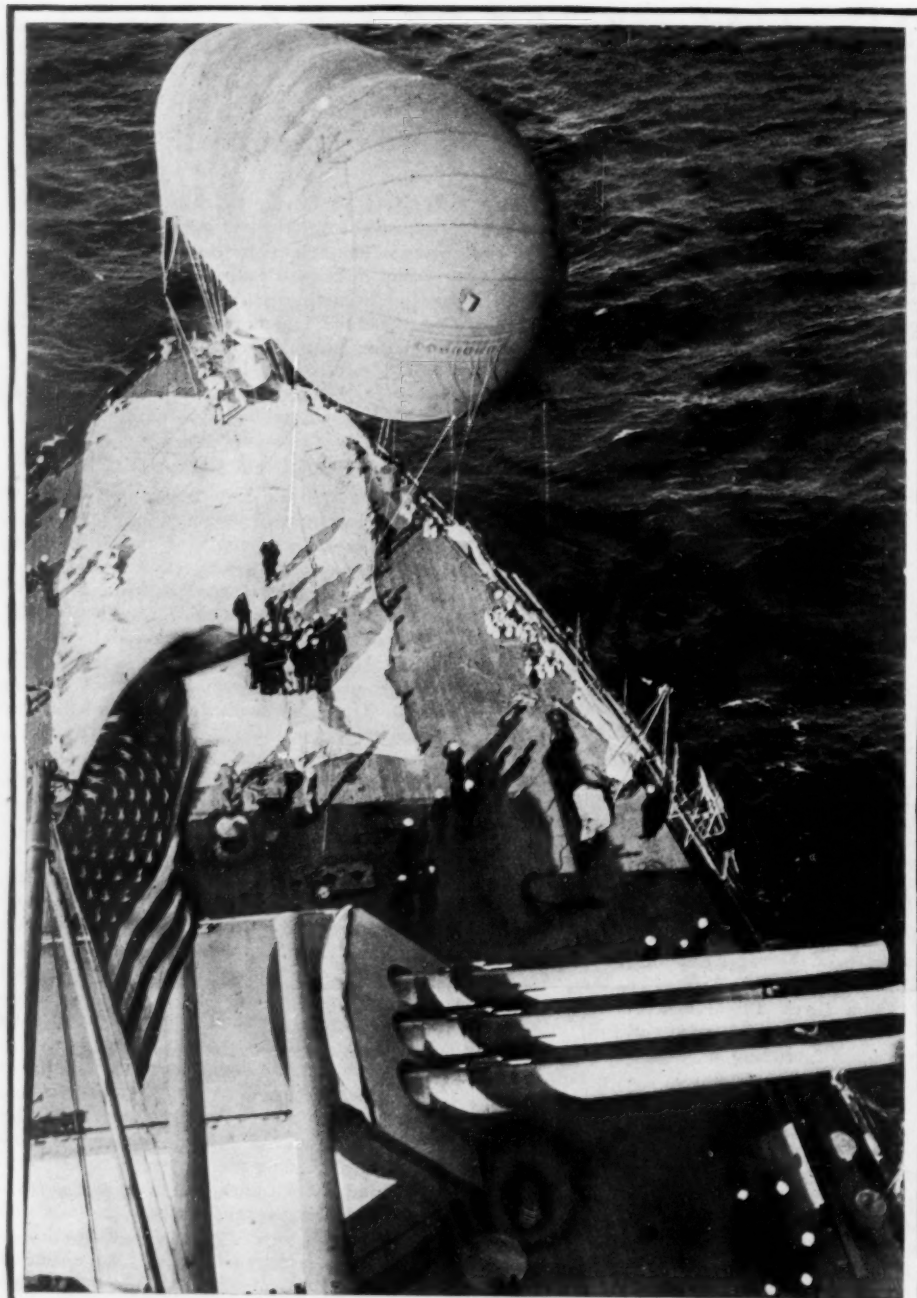
2000 LEYLANDS A YEAR

London, June 12—It will be of interest to the American trade to compare the latest output and financial statements just issued by the Leyland Motor Co., which may be taken as representative of the half dozen largest motor truck manufacturing companies in Great Britain, with similar statements and the output capacities of the largest American producers. The present rate of production at the Leyland plant is 2000 trucks per year, including spare parts. The capacity, when sufficient steel and other raw material are available, is over sixty trucks per week, or slightly more than 3000 per year.

Practically the whole of the output is now purchased by the British government for transport purposes of the Royal Flying Corps. The company also supplies the Indian government with motor trucks. In addition, it has on hand a large number of civilian orders for after the war.



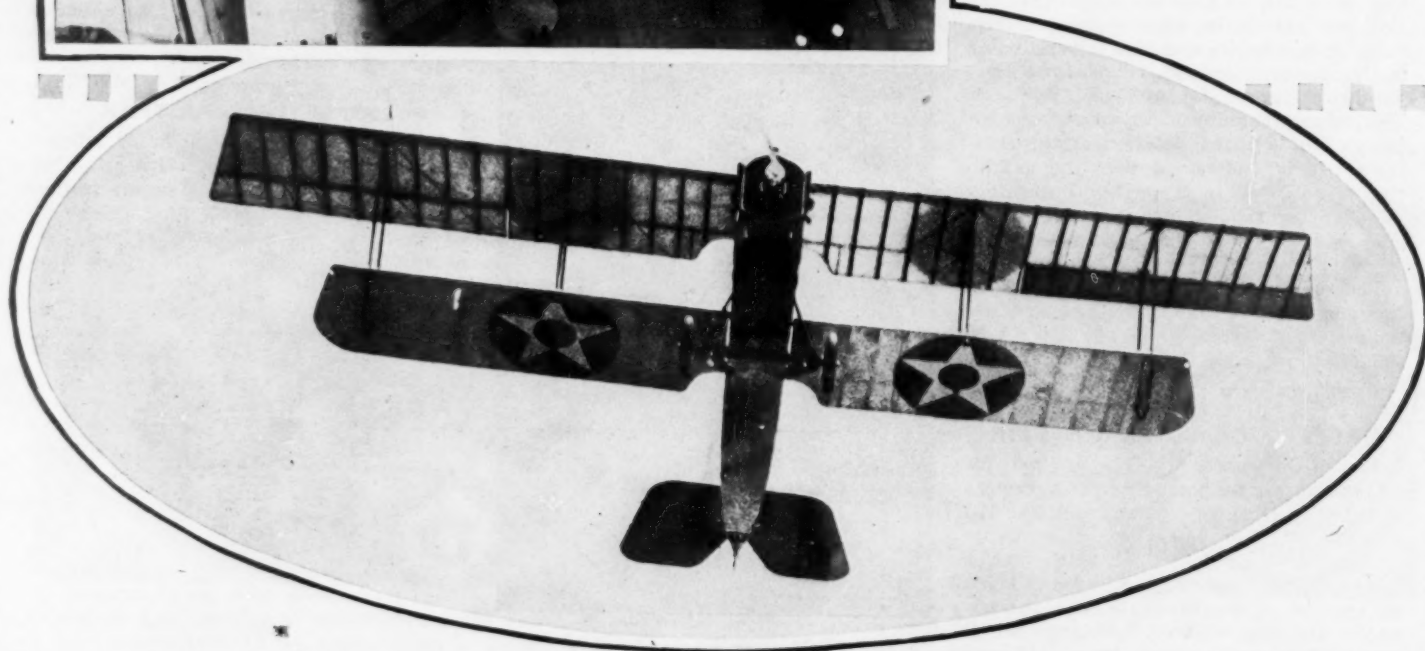
The glass that caused a fine



RECORDING WAR BY CAMERA HERE AND ABROAD

On the trail of the submarine, or so this photograph might be titled. The campaign against American boats in home waters has spurred our Navy to further action. Here is one of the huge observation dirigibles which can be released from its place on the ship to scour the sea for signs of the enemy. It is aboard one of Uncle Sam's most recently built and modern dreadnaughts and is ready to fly

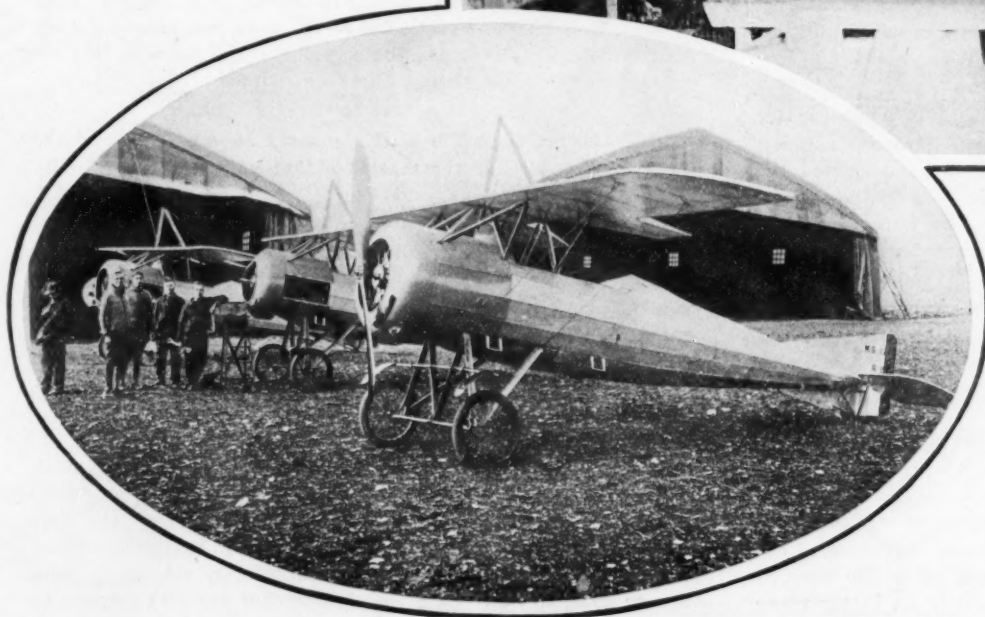
Beneath is a plane from the marine corps. It is shown going into the loop. It turns its nose directly toward the heavens before starting the loop-the-loop, which later will help confuse the enemy's efforts in air battles overseas



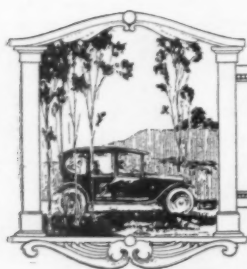


This photograph shows the truck park at Camp Holabird, Baltimore, Md., one of our great motor repair depots. Later these trucks will be serving the army overseas together with others

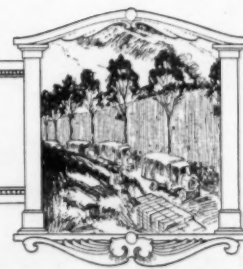
The girls at the right are serving in a Signal Corps supply house somewhere in France. This is a station for the recharging of storage batteries. Women not only are taking the places left vacant here by men who are fighting but French women are helping the American forces abroad



American aviation training schools in France fast are preparing men for active service. This is one of the many stations of this kind in France. Plenty of training planes have been provided for our aviators to make them proficient



EDITORIAL



America's Aircraft Progress

THE wisdom of America deciding one year ago to develop a standardized type of aircraft engine, which has become known as the Liberty engine, is now definitely shown by the fact that the present Liberty engine develops 50 hp. more and weighs 100 lb. less than the European type of engine of which it was urged last summer that we take up the manufacture. The Liberty engine in cost approximates \$5,000 to \$6,000, whereas the European engine would have cost between \$10,000 and \$11,000. The reason for this difference in cost was easily noted last week in Dayton, when it was possible to see both engines at one time. The simplicity of the Liberty was everywhere apparent.

THE reason why we can build an engine for \$5,000, whereas it would cost \$10,000 to build an European design in our own shops, is that the Liberty is an exemplification of a combination of American engineering, carried out according to American methods and designed to be built in American factories with American tools.

WITH such a program it has been possible to get into production on the Liberty engine in eight months, whereas it was stated a year ago and also stated in a recent official Government report from Europe, that it requires twelve months from the completion of the design or conception of an airplane engine until the first of that engine is in serious production. The simplicity of the Liberty engine, its being designed so as to be manufactured in American factories and its being designed for rapid production, are the reasons why it has been possible to get into production in eight instead of twelve months.

AMERICA is much further ahead to-day with its Liberty engine program and is producing more of these engines than it could have been producing European engines, if the production of them had been decided upon a year ago and our factories had started at that time to make jigs, special tools and tuned up for production.

THE Liberty engine is now being produced in much greater quantities than some of the best-known European engines. It has been stated that if America were to have started the manufacture of European types which have been designed to be manufactured in European shops, according to European minds and on European machines, it would not have been possible to secure in this country enough expert men in the use of the file to carry out the finishing and fitting program that is followed on the European design.

THE Liberty engine besides being used for planes for land work is being very largely used in hydroplanes and flying boats. The latter, using Liberty engines, are flying for ten consecutive hours.

THE success of the Liberty engine in Europe is well indicated by a cable recently received which states that some of the first Liberty engines arriving in France were flown by some of the best British officers who declared there is no better plane

in France than the de Havilland fitted with the Liberty engine, which is being manufactured in this country.

THE great value of standardization not only in the Liberty engine, but in the de Havilland plane in which it is used, was shown in the quick time in which it was possible to assemble the plane and fly it in France. Within 2 hr. after the crates containing the fuselage with the engine and the other crates containing the wings and controls reached the flying fields the wings were in place and the machine had taken the air. These wings had not been manufactured for any particular plane but any set of wings would serve for any fuselage because the standardization of them is carried through to the minutest detail.

GREAT progress is being made in the general development of our airplane program and many features in this program indicate the resourcefulness of the people who are handling the work. For example, it has been definitely shown that Douglas fir is as suitable for wing beams and other airplane parts as is spruce which is becoming so scarce. Notwithstanding the scarcity of spruce the production has steadily increased from 2,000,000 ft. per month to 15,000,000 a month. Sometime ago when there was a shortage of linen for covering the wings, which shortage was somewhat due to the Irish situation, as most of the linen came from Ireland, we turned to the manufacture of cotton from Sea Island fiber and are now making cotton covering which is the equal of linen. There is a supply of cotton equal to all requirements.

IN many other ways the resourcefulness of our people in connection with the airplane program has been indicated. We have planted huge areas of castor oil beans to furnish the oil which is necessary for lubrication, as the steel cylinders of the Liberty engine require the use of this kind of oil. We have developed our own dope for treating the fabric on planes and while we were not able to import some of the chemicals from Germany we have already developed the manufacture of them so that we are now independent of any European sources.

THE Liberty engines used in the Navy have so increased the performances of the machines that new life has literally been instilled into the personnel.

MANY people do not realize that our aviators in training at our different camps are daily flying 220,000 miles, which is equivalent to almost ten times around the world. It is not so surprising if two or three accidents should be reported per day and nobody should imagine that we are having an unnecessarily great number of accidents when the amount of flying is considered.

WHILE great progress has been made to date in aviation much greater things must be done. The offensive strength of Germany is not realized by the people of America. Before the start of the war Germany had come to the conclusion that final victory might come through the air. She immediately set out, as long ago as 1912, to build six-cylinder Mercedes aviation engines in

great quantities and had literally hundreds of these in readiness when war was declared. She has for months been laying her plans to put airplanes by tens of thousands in the air, and if we are to meet her and win we must put tens of thousands in the air also. England is putting approximately 3000 planes per month on her front; France is putting 2000 per month. These figures represent about the production of these countries and it is up to America to produce planes in tens of thousands.

AMERICA should not make the mistake of not producing the present planes in quantities on the ground that they are not so perfect as they should be and that we should wait until they are perfect before putting them into production. If we took a homely parallel with the development of the motor car over

the last ten years we would find that no car manufacturer refused to build a 1912 model because he knew he would have a better one in 1913 and that he preferred to wait until 1913 had come. That would have been absurd, yet to-day many of our people are talking in this language on airplane production. We will never get any place with airplanes if we do not build the types we have and keep on building them until we have better ones ready for production, when the manufacture of the old may be dropped and that of the new taken up. This truth is epitomized in the old proverb of "the best is often the enemy of the good," which in paraphrase means that if we delay manufacturing the good types until we have the best, then we will not make much progress and the ideal views of the best will have been the cause of the delay.

TWENTY-SEVEN AERIAL FIELDS

Washington, June 21—Opening of March Field, Riverside, Cal., and Souther Field, Americus, Ga., makes a total of twenty-seven flying fields now in use for training aviators and experimental purposes. These fields are under the Department of Military Aeronautics. March Field is named in honor of Lieut. Peyton C. March, Jr., who was killed in the service as a flyer. It is under command of Major J. C. P. Bartholf.

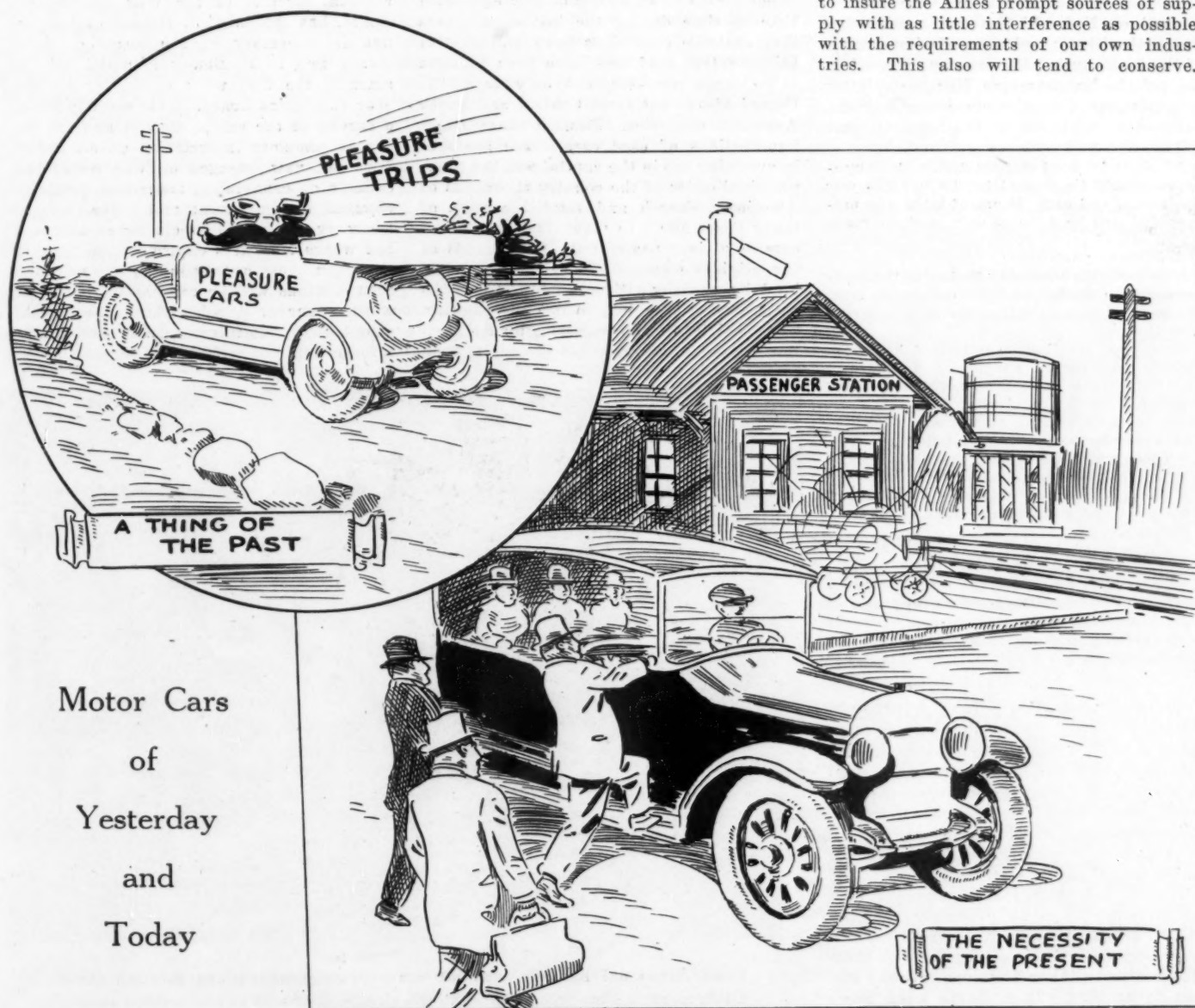
The Souther Field is named for Major Henry Souther, who died in the service, and is under the command of Major C. H. Wash, junior military aviator, Signal Corps.

Commissions as first and second lieutenants in the non-flying section of the Signal Corps Reserves will be given 1700 cadet flyers now training in British, French and Italian flying schools. After qualified as flyers, the commissions will be transferred to the flying section.

COMMITTEE TO ALLOCATE OIL

Washington, June 21—Oil purchases for the Allies will be allocated by a committee appointed to-day by the United States Fuel Administration. The committee comprises A. C. Woodman, director of purchases of lubricants of the oil divisions, and J. A. Noffett, Jr., secretary of the National Petroleum War Service Committee.

The object of this committee is to accomplish the most equitable distribution of the orders of the Allies for oil throughout the entire industry and at the same time to insure the Allies prompt sources of supply with as little interference as possible with the requirements of our own industries. This also will tend to conserve.



Motor Cars
of
Yesterday
and
Today

To Class Roads by Value in Wartime

Government Would Build and Construct Highways of Prime Importance Only

WASHINGTON, June 21—That road construction and maintenance during the emergency period should be viewed from a military standpoint is set forth by Secretary of Agriculture Houston. Expenditure of labor and materials should be directed only to those roads of prime, economic and military importance. Bond issues for road construction are undesirable at this time. Maintenance of all important highways already constructed should be continued. Important roads are those needed for the military establishment, carrying materials essential to war industries or bearing importantly on production and distribution of food supplies. These policies were set forth by Secretary Houston in a letter to the Council of National Defense, defining the attitude and policies toward road construction and maintenance of the federal agencies dealing with this problem.

The Highways Transport Committee, Council of National Defense, recognizing the vital military and economic importance of the highways of the country emphasizes the policies in Secretary Houston's letter in a statement to the state highway departments. The text of the letter in part follows:

All plans for road construction and maintenance should be viewed in the light of war conditions, and expenditure of labor and materials should be directed only to those roads which are of prime importance for economic and military purposes.

It is desirable to avoid offering to the market issues of bonds which are not urgent from the point of view of aiding the nation in winning the war.

As far as practicable important highways already constructed should be maintained, and only those should be constructed and completed which are of vital importance because of their bearing on the war situation. These may be summarized as follows:

Those which are utilized or will be utilized by the military establishment.

Those which carry considerable volume of material and supplies essential to war industries.

Those which have a bearing on the production and distribution of food supplies, connecting population and shipping centers with surrounding agricultural areas.

It is especially desirable to use wherever possible local road materials to simplify the rail transportation problem.

WORK OF RED CROSS MOTORS

Chicago, June 21—The American Red Cross fleet in France now consists of 634 vehicles, which handle an average of 2500 tons of freight monthly at fourteen ports, move nearly 1000 tons a week from the Paris stations and Seine landings, as well as transport supplies, workers, refugees and wounded in all sections.

Trucks, ambulances and passenger cars all serve at times as passenger vehicles. In two months they answered 2528 calls to move persons in Paris alone, many of them refugees to be taken from one railroad station to another. In a single week there

were 233 city calls, 130 for journeys outside of Paris, and forty-seven cars were sent for prolonged duty near the army lines.

In this fleet are 385 trucks and ambulances, 246 passenger cars and twenty-two motorcycles. The Red Cross maintains two large garages and a motor park in Paris. Fifteen other garages meet the needs of the port and other transportation services. Complete machine shops with skilled mechanics are maintained at the chief garage. Over 80 per cent of the Red Cross supplies have to pass through Paris on their way of relief, and practically every article shipped by the Red Cross from America is handled at some points in one of these motor vehicles.

USE OF CARS IN MEXICO

Monterey, Mexico June 21—It may truly be said that Mexico is a land of second-hand motor cars. While there have been importations of small lots of new cars from time to time during the last eight years that unstable conditions have prevailed in this country, used cars have been brought in in large numbers, not only from the United States but from Central and South American countries. Besides these direct importations of used cars, there are still in everyday use in the capital and the other principal cities of the country thousands of American, French and English models of many years ago. In many instances these cars long since passed out of the hands of the original owners. Many were left behind by wealthy citizens, when, for political reasons, they had to flee the country. They fell into the possession, by confiscatory methods, of army officers and public

officials of the various successive revolutionary regimes through which the country has passed since the ousting of the late General Porfirio Diaz from the presidency. Most of the higher Government officials have succeeded in keeping themselves supplied with new cars from time to time, but for the most part old and badly worn out cars are still in use throughout the country. The one exception to this condition is the thriving Gulf port of Tampico and the adjacent oil-producing region. The importation of new cars by American oil operators and other business men of Tampico has kept up right along. Some idea may be had of the practical uses to which cars are put in the Tampico region by the statement that one of the large American oil companies there is building a 65-mile motor road to connect the field, where it is operating, with Tampico. It is expected that within the next few years a splendid system of highways will run all through the oil-producing region. Tampico is well supplied with garages and repair shops and in these respects it is said to be ahead of any other city in Mexico.

DETROIT MUNITION COMMISSION

Detroit, June 21—Allan A. Templeton, regional director of the War Indemnities Board, has appointed J. Hubert Cullen, industrial secretary of the board of commerce, and B. F. Emory to assist him in starting the first work called for by the War Industries Board. This work includes a survey of the entire district and the filing of complete information on all industries not now engaged on war work, but capable of conversion, industries partially engaged on war work and industries entirely engaged on this character of work but whose contracts expire within a short time. In every county in the state branch organizations will be established that will work whenever possible through the local chambers of commerce. All preliminary information will be obtained through them.



Here Arabs are helping push the army photographer's car through the Dila river in Mesopotamia, one of the accidents of war in the eastern zone

Mr. Cullen has been working along this line for some time and is familiar with the industrial situation. He has already lined up the industries of Detroit so the local commission will confine its time largely in rushing the state work to completion and renewing the industrial survey recently made in Detroit. Ultimately the work of this commission will include the procurement of materials, supervision of production and all other factors entering into the manufacture of war materials. Plans are being arranged whereby labor will be adjusted to a great extent. For instance, where two plants are working on Government contracts, each independent of the other, arrangements can be so made that they combine their efforts and work together with a view of releasing the extra men for use in other plants. It will also be the aim of the commission to conserve materials.

GOODYEAR SALES MAKE RECORD

Akron, Ohio, June 21—Sales of the Goodyear Tire & Rubber Co., for April aggregated \$14,881,933, the largest month in the company's history and a rate which if continued for a year would mean a gross of \$178,000,000 for the period. Sales for the fiscal year ended Oct. 31, 1917, totaled \$111,450,643. For the first six months of the present fiscal year, ended April 30, sales totaled \$60,461,804, which is \$17,220,754 in excess of the corresponding period of the previous year, or a 40 per cent gain.

CHAUFFEURS NOT DOMESTICS

Washington, June 21—Chauffeurs, private and public will not be considered as domestic servants under the "work or fight" order and will not be liable to draft. Provost Marshal Crowder ruled today that chauffeurs of all classes, except those who actually engage in domestic work, will be exempt from the "work or fight" classifications.

Coal Curtailment Has Not Been Ordered

Fuel Administration Reverses Denial and Indicates 25 Per Cent Cut Will Be Made

WASHINGTON, June 21—Reversing its denial the Fuel Administration now states that there is a probability of curtailment of coal to the motor car industry for the season 1918-1919. The reduction will be to 25 per cent of that consumed in 1917-18 and applies only to what Doctor Garfield terms "pleasure car production." The curtailment does not affect the manufacturer of passenger cars manufactured for other than pleasure purposes, motor trucks or the enormous amount of other war work motor car companies are engaged in.

The order for this curtailment has not been issued. In fact, the matter is yet indefinite and vague and Doctor Garfield's announcement is more or less a warning of what may be expected during the coming year if the fuel situation does not improve. Such an order as has been suggested, according to statement made to-day by the Fuel Administration, "will await the determination by the War Industries Board of the amount of raw materials to be allowed the 'pleasure motor car' industry."

Doctor Garfield has stated, however, that regardless of the amount of steel available he will be compelled to limit the fuel for the manufacture of passenger cars to not over 25 per cent.

MICHIGAN WILL GET LESS COAL

Detroit, June 21—If Michigan receives only three-quarters of its normal coal supply of anthracite this year, as indicated by a statement issued by the anthracite committee, this section will suffer a coal famine just as it did last year. Using the

season 1916-17 as a basic coal year, the committee has allotted Michigan only 1,201,000 cars of coal this year, or a decrease of 24.42 per cent. The entire central states will receive an allotment showing a decrease of 31.73 per cent according to the following chart:

Central States	1916-17 Distribution	1918-19 Allotment	Per cent decrease
Ohio	585,626	246,250	57.95
Indiana	710,274	284,110	60.00
Illinois	2,215,122	1,750,585	20.97
Michigan	1,589,002	1,201,000	24.42
Total increase Central States.....31.73			

The eastern states—New England and Atlantic states—will receive a greater allotment this year. Over 2,000,000 cars of anthracite will thus be diverted from the Central states.

The following chart shows the number of cars of coal—anthracite and bituminous—arriving for Detroit and Michigan as reported by the American Railway Association:

	February	March	April	May
Detroit	13,620	19,904	14,208	14,107
Michigan	14,495	19,493	16,941	14,670

On April 1, 720 cars arrived; the next day 637 cars came in; the following day a lesser number was received, and fewer cars arrived each succeeding day until the end of May, when only a total of 334 was registered. This indicates how coal shipments are decreasing. Freight rates will advance on June 25, 50 cents on anthracite and 30 cents on bituminous.

No fear of lack of coal need be expressed unless the quantity shipped in becomes much less than it is. If, however, insufficient quantities of anthracite coal arrive it will mean that industries will have to share part of their supplies with the householders and be obliged to retard their production.

SHAW HEADS TEXAS ARMY SHOPS

Fort Sam Houston, Tex., June 21—It is announced by the military authorities of the Southern Department here that the new motor repair machine shop which is to be constructed upon a tract of 84 acres of land immediately southwest of San Antonio will be under the direction of Major Arthur M. Shaw, Construction Quartermaster Mechanical Repair Unit No. 304. Major Shaw comes to San Antonio from Atlanta, Ga., where he is just completing a similar shop.

The main shop buildings, which will cost more than \$1,000,000, will be of steel frame structure 500 ft. square with all-glass sides, and will be devoted exclusively to repair work. Another building of the same type will be erected on the tract and will be used for storage of parts and repaired vehicles. A large garage also will be used for storage of finished vehicles held for shipment. Barracks will be erected nearby for the housing of the whole of Mechanical Repair Unit No. 304. Space is being reserved on the northeast corner of the area for another repair shop to be built later.



Each shell has its tale to tell to some Teuton. Just one of the depots from which shells are started to the front. It shows only a few of the millions

Airplanes Too Costly for General Use

Commercial Means for Carrying of Mails Spreading Throughout the World

DAYTON, Ohio, June 22—Airplanes will not be flying around like herds of Ford cars for some years after the war closes, according to C. F. Kettering, inventor of Deleo ignition and lighting apparatus on the Liberty airplane engine and also one of the best scientists connected with the motor industry. While Mr. Kettering is a great aviation enthusiast and has flown planes for years and is constantly engaged on development work connected with planes, as well as being head of the Dayton-Wright Airplane Co., he does not let his enthusiasm run away with him.

Airplane engines are too costly to-day to come into general use. The engines in some European planes cost \$30 per horsepower and in some of our best engines, such as the Liberty, the price is \$11 per horsepower and higher. Until the price of the engine is around \$5 per horsepower Mr. Kettering does not think the airplane will come into the general use that the motor car has.

One Costly Aspect

The engine is only one of the costly aspects of aviation. You must have a hangar or garage to house the plane and at least two mechanics are needed to take care of it. At present you require a very large field to land in and Mr. Kettering, who is also president of the Society of Automotive Engineers, does not think it will be possible for people to own farms that can be kept specially for landing airplanes. Aviation landing fields will spring up in communities and a score or more of planes will use the same field.

The commercial use of the airplane is

spreading rapidly in the carrying of mails, and it will not be long before there is a regular mail schedule between New York and Chicago and also between Chicago and such adjacent cities as Milwaukee, St. Louis, Minneapolis, Kansas City and Denver. From these centers distribution will be extended to Salt Lake City and the Pacific Coast as well as to the Gulf of Mexico and the Atlantic Coast. The commercial value of planes in such work already is assured. The use of planes for mail carrying will be followed soon by special parcel post planes and this in turn by others specially designed for load carrying and well suited to express shipment. It will not be surprising if in a few years business men having to make a special trip from Chicago to New York will charter a special airplane rather than resorting to the special railway train.

In other parts of the world the development of the airplane for uses of commerce is extending. England has in mind a special airplane mail service from London to Sydney, Australia, by way of Asia Minor and India. There will also be airplane mail service from the Mediterranean south to Cairo and thence from end to end of Africa, connecting Alexandria at the north with Cape Town at the south and coupling enroute such centers as Johannesburg, Kimberly and other cities.

In the western hemisphere the necessity for airplane mail service is very great. We now have a twenty-two-day mail boat between New York and Buenos Aires with very few ships. An airplane service to the West Indies and from these to the coast of Brazil and thence south to Buenos

Aires will bring that southern metropolis within a week of the metropolis of the northern half of the western hemisphere. Time is the great factor in the transaction of business. An improved mail service with the Latin-American republics will establish much closer business relationships with them and will be a distinct advantage in our foreign trade.

U. S. TO MAKE SINGLE-SEATER

Washington, June 22—Production of a fast single seated fighting airplane will soon be under way in this country; the machine selected is said to be the development of a modern British pursuit plane which has been very successful. Details of construction and performance of this machine have not been made public.

Up to this time construction of single-seated fighting machines has not been undertaken in this country as they have been turned out by the French and British factories for the American army.

MAY REDUCE AERIAL POSTAGE

Washington, June 21—In the first month's operation of the aerial mail service between New York, Philadelphia and Washington a total of 5.2 tons of letter mail was transported. The planes carrying mail covered 11,109 miles and had a total of 157 hr. 59 min. in the air. The average speed through storm and fair weather for the month was slightly in excess of 70 m.p.h. Twenty-one out of twenty-six flights were completed at Belmont before 4 o'clock in the afternoon, twelve of them being between 2:30 and 3 o'clock.

Lieutenant Edgerton has to his credit twenty perfect flights of 130 miles, never having to make a stop enroute, and without damaging a plane. Lieutenant Culver, flying between New York and Philadelphia, has thirteen perfect flights to his credit, never having to stop enroute and having no damage to his plane. Lieutenant Webb has eleven perfect flights to his credit.



Wreckage of big German plane brought down near the Marne at Chateau Thierry. It is a twin-engine Gotha

Lieutenant Kilgore made nine non-stop flights and two interrupted flights. Lieutenant Bensal made fifteen non-stop and four interrupted flights, and had one damaged plane. Lieutenant Miller made eleven non-stop flights, four interrupted flights and two planes damaged.

In view of the success obtained in the first month's operation of the service and the fact that the capacity of the machines is not being fully utilized, the department has under consideration a reduction of the postage rate on airplane mail.

X-RAY ARMY TRUCKS

Washington, June 21—One and one-half ton General Motors Co. trucks equipped with special bodies made by the H. M. Babcock Co. will be used by the Medical Department of the United States Army for mobile X-ray equipment. Each truck will carry a complete X-ray outfit with a specially designed collapsible X-ray table. A stationary gas engine is included in the equipment and generates the electrical power for the X-Ray. The sides of the truck body can be converted into tables on which the patients can be treated. The arrangement is such that the X-ray table is taken out of the truck and built up with the X-ray connection of the truck made by a hose.

A demonstration of this truck and X-ray was successfully made here to-day before English and American medical officers.

CANADA TO KEEP ITS TIRES

Ottawa, Ontario, June 21—Exportation of tires for motorcycles, motor vehicles and all other tires containing rubber, has been prohibited to all destinations outside Canada, except under license, issued by the Minister of Customs on the approval of the war trade board.

Machines for farming purposes and vehicles and implements moved by mechanical power may be imported free of duty by a settler, if actually owned abroad by the settler, for at least six months before his removal to Canada.

MAIL MOTORS SHOW SURPLUS

Washington, June 22—Motor truck mail service showing a surplus of \$200,000 for its first six months of operation warrants immediate legislation for road construction that will extend the service throughout the country. This was the statement of James I. Blakslee, Assistant Postmaster General, yesterday before the House Postoffice Committee. Mr. Blakslee appeared before the committee to urge the building of highways as a part of a National highway system.

A PLANE EVERY TEN DAYS

Cleveland, Ohio, June 21—The new plant of the Glenn L. Martin Co. was dedicated May 29. The company will complete one advanced type airplane every ten days until October, when production will be speeded up to one plane daily.

JULY TRACTOR DEMONSTRATION

Salina, Kan., June 21—The national tractor demonstration of the National Implement & Vehicle Association will be held here July 29—Aug. 3. Plans and rules of operation will be announced later.

How Great Britain Commandeers Motors

Definite Schedule of Payment Is Adopted with Provision for Regular Inspection

LONDON, June 12—In exercising its power to commandeer the services of commercial motor vehicles used by private owners, the new road transport board has established a definite scheme to cover payment for vehicles used in this way. To avoid confusion regarding payments, a definite schedule has been adopted and this schedule will apply also to vehicles taken over at any time temporarily by motor volunteer units. Under the new scheme cars are divided into five groups:

- a—For loads of 3 tons and up.
- b—30 cwt. to 3 tons.
- c—15 cwt. to 30 cwt.
- d—motor cars.
- e—motorcycles.

Owners of cars in classes a and b will be paid \$20 a day; for classes c and d \$15 a day, and for class e \$3.75 a day if their vehicles are called up on national emergency. On being called out for service, tires, gasoline and other stores will be supplied, and repairs effected free of cost to the owner. These rates are only payable for service up to sixty consecutive days; not for periods longer than this.

If the vehicle is destroyed, compensation will be paid at a rate equivalent to the value of the car when taken over plus 25 per cent, provided the resulting amount is not greater than the original purchase price

or less than 30 per cent of that same price.

The value at the time of taking over is estimated by deducting from the original price $7\frac{1}{2}$ per cent for each half year or part of a half year which shall have elapsed since the car was delivered by the manufacturer to the purchaser. As an alternative, the army council at its discretion may provide an equivalent vehicle to replace the one destroyed.

At least once every year an inspection officer shall be given adequate facilities to inspect and test the vehicles coming under the scheme, and if his report is unfavorable the agreement may be terminated.

JUNE PRICE CHANGES

Anderson, Ind., June 22—The Laurel Motors Corp., which manufactures the Roof sixteen-valve head equipment for Fords, has increased its price to \$100, effective July 1.

Wayne, Mich., June 21—The Harroun Motors Corp. will increase the list price of its car from \$895 to \$995 June 30.

The Auburn Automobile Co. announced an advance in the prices of all models, effective June 1, as follows:

MODEL 6-39-B	
Chassis	\$1,445
Convertible sedan	1,695
Sport	1,495
Sport convertible	1,745
MODEL 6-44	
Sport	1,785
Sport convertible	2,035
Touring	1,785
Convertible sedan	2,085
Seven-passenger sedan	2,550

The chassis price of the model R-4 1 $\frac{1}{4}$ -ton Ranier advanced from \$1,350 to \$1,475 June 1.

The National Motor Car & Vehicle Corp. increased the price of each model \$300, effective June 1 and as follows:

SIX-CYLINDER		NEW PRICE
MODEL		
Touring		\$3,120
Roadster		3,120
Sedan		3,120
TWELVE-CYLINDER		
Roadster		\$3,650
Phaeton		3,050
Roadster		3,150
Sedan		3,720

The Elkhart Carriage & Motor Car Co. advanced the price of its Elcar four-cylinder touring and roadster models from \$1,095 to \$1,175 and the six-cylinder touring and roadster models from \$1,295 to \$1,375, effective June 10.

The price of the Maibohm model B six-cylinder touring cars increased to \$1,150.

The price of the Oldsmobile six will be advanced \$100 July 1.

The price of the Elgin five-passenger and four-passenger roadster model increased from \$1,095 to \$1,165.

Other price changes are:

	NEW PRICE	OLD PRICE
Reo, four-cylinder, 2 and 5-pass.	\$1,295	\$1,225
Studebaker, SH-4-40, 2-pass.	1,125	1,050
5-pass.	1,125	995
Sedan	1,685	1,525
EH-6-50, 2-pass.	1,585	1,450
4-pass.	1,585	1,395
5-pass.	1,585	1,395
E-G-6, 5-pass.	1,985	1,795
Sedan	2,185	1,950

The Saxon will advance from \$1,045 to \$1,195 July 1.



Wilbur D'Alene, racing driver, is now at Kelly Field, Tex., where he instructs future mechanics in the 869th Aero Squadron

Men Behind War Activities



Three snapshots from the midsummer meeting of the S. A. E. at Dayton—Elmer A. Sperry, president of the Sperry Gyroscope Co.; Orville Wright, in whose honor the dinner for 1200 persons was held; and Charles F. Kettering, S. A. E. president

DAYTON, Ohio, June 21—Our allies are looking to America to provide in increasing measure each day the aircraft and airmen which eventually will be the determining factors in winning the war. That this country is living up to the part assigned to it in the production of men and equipment for the war in the air was made certain to the 1200 persons who attended the Orville Wright dinner in connection with the summer meeting of the Society of Automotive Engineers Monday evening. As was brought out in *MOTOR AGE* of June 20, the dinner was the culmination of the first day of the two-day session which convened Monday and Tuesday at Dayton. When Orville Wright rose to acknowledge the honor of the dinner, he was applauded with more enthusiasm than ever greeted another member of the society.

It is fitting that this acknowledgement to the father of aviation should have been given in his home city where the first man-carrying aircraft was developed and where

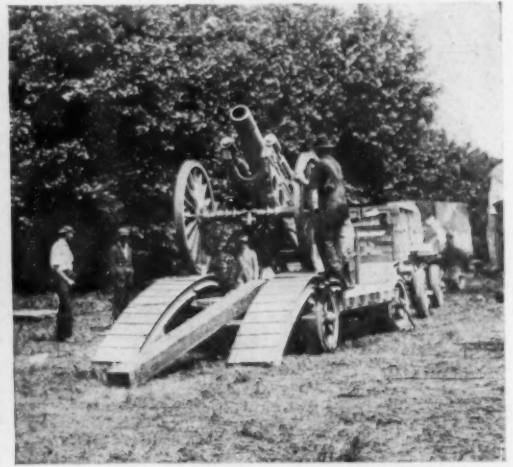
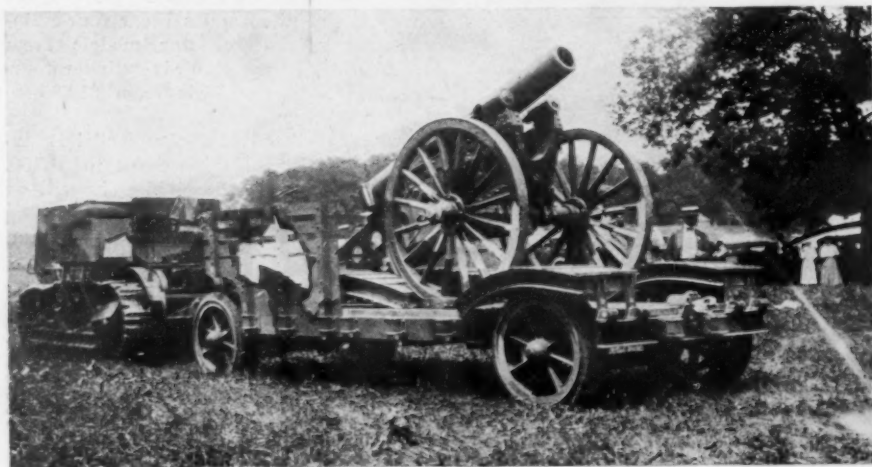
By Darwin S. Hatch
Editor Motor Age.

now scores of American battleplanes are taking the air daily for their test flights before being shipped across to serious work over France and Germany. From an ovation to Orville Wright the dinner developed into a continuous round of applause for the de Havilland battleplane, with its four machine guns, the Liberty engine and the progress of the general aircraft program.

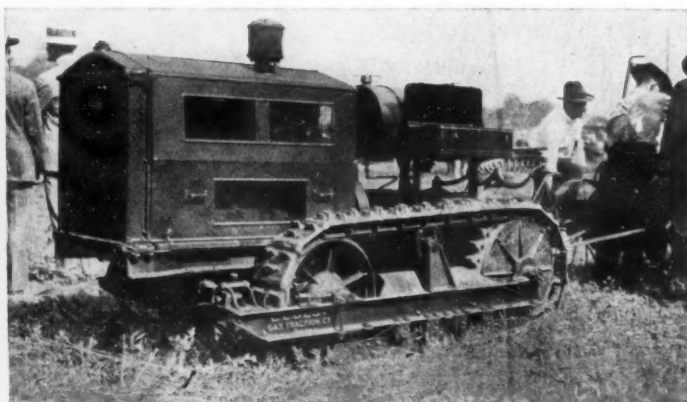
MOTOR AGE told last week how the exhibition flights of the dozen training planes and half a dozen Liberty engine de Havilland battleplanes aroused the enthusiasm of the engineers and also told of the exhibit in the pavilion of an American battleplane and its parts, the original Wright machine and present-day battleplanes of our allies and Germany. Those who knew engines were at once struck with the very great simplicity and accessibility of the

Liberty engine as compared with aviation engines of European manufacture, many of which were shown. From the standpoint of quick manufacture, quick assembly and quick repair, there is no comparison. Its behavior under test showed that the Liberty engine produces more horsepower per pound of weight than any of the others.

At the dinner the speakers' table provided a gathering of some of the biggest men to whom America looks for airplane production. President C. F. Kettering, who acted as toastmaster, formed the center of a list including General William C. Kenly, recently appointed head of aircraft training in this country; Howard E. Coffin; Col. E. A. Deeds; Orville Wright, F. G. Giffin, one of the society's delegates to the International Airplane Congress in London; C. M. Manley, chairman of the airplane standard division of the standards committee of the S. A. E.; Col. J. G. Vincent, who is credited with being chiefly



The method used in unloading heavy guns from the trailer which the heavy-gun tractor hauled was demonstrated, at right, while the manner of carrying a big howitzer also was explained by exhibits from the Ordnance Department



Tractors also had their part in the two-day meeting at Dayton, and here two of them, a Best and a Case, are shown demonstrating their ability in the field

responsible for the design of the Liberty aviation engine; Lieutenant Miozzi, the representative of Italy; S. S. Bradley, of the Manufacturers' Aircraft Association; and Director Stratton of the Bureau of Standards.

Most important among the points brought out during the talks at the dinner were, first, the American aviation program is being carried forward in a way which overshadows our previous record of production; second, the recent charges of lack of progress of the airplane program were based on a lack of knowledge of the true situation; and third, the very immediate need of pushing the airplane production for overseas service.

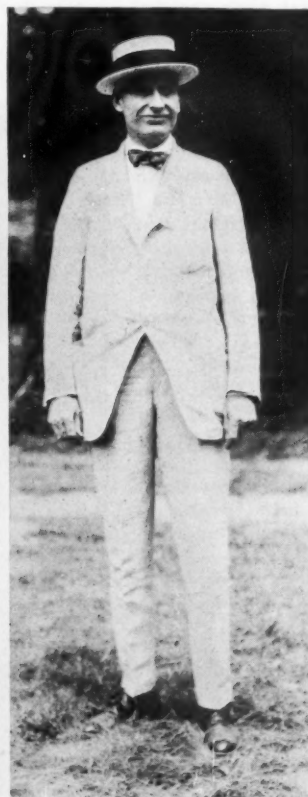
Preparation on the part of Germany to win the war with airplanes was definitely stated. Germany was working to produce tens of thousands of planes; France and England practically have reached their highest point in airplane production, and America must take up their burden. Our training planes are flying 220,000 miles each day. Our de Havilland battleplanes with Liberty engines have been so standardized that recently when one shipment arrived in France, a plane was assembled and was in the air in less than 2 hr. after

the crate containing the wings and the crates containing the fuselages arrived at the flying field. Wings from any plane fit the fuselage from any other plane. America has found that Douglas fir is as good a material for airplanes as spruce, so that the spruce shortage will not affect production. The shortage of Irish linen was overcome by developing a fabric from sea island cotton for covering the wings. The cotton fabric proving as good or better than the linen. All the way through it has been found possible to develop American material which wears as good or better than other material which has become short, but which previously was thought to be the only thing possible for service.

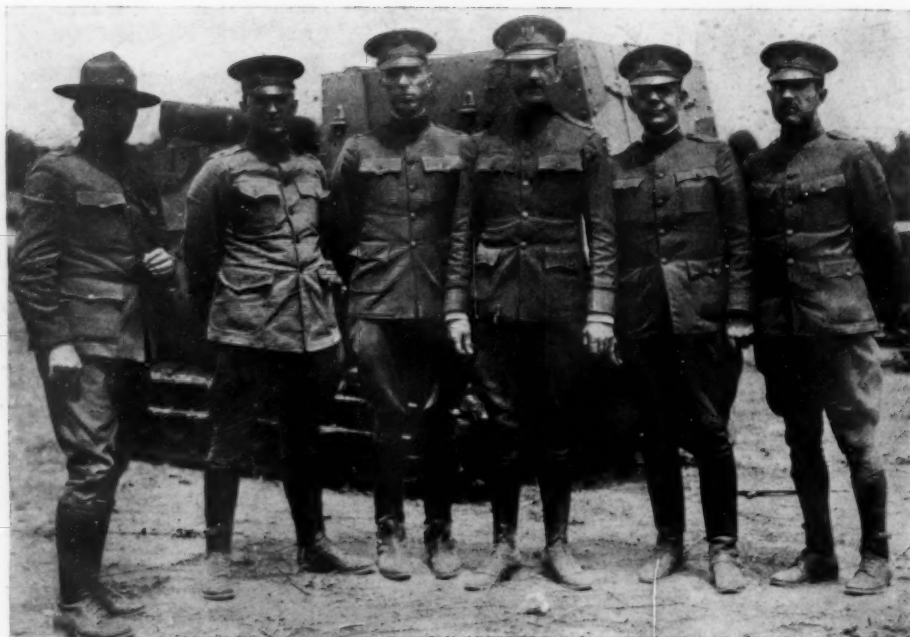
Col. E. A. Deeds of the Aircraft Production Board voiced the opinion of those in touch with Washington that there is no

chance that the war will end this year. His talk was the first public statement that Colonel Deeds had made since the aircraft investigation started. Referring to the aircraft investigation, he said that one very satisfactory thing is the fact that the Liberty engine does not read the newspapers but it will be able to answer for itself in performance.

Howard E. Coffin, former head of the Aircraft Production Board, who demanded that President Wilson order a rigid investigation of the work of the board, made his first extended statement relative to aircraft production in America since his resignation. Mr. Coffin's speech before the society was in the nature of a vindication of the standardization of American planes and of the manufacturing policy and program followed by the Aircraft Production



Others of the men behind war activities—F. S. Duesenberg, chief engineer of the Duesenberg Motors Corp.; Col. E. A. Deeds, Howard E. Coffin, and C. M. Manly, chairman of the airplane division of the S. A. E. standards committee and one of the pioneer flyers. Mr. Manly piloted the Langley airplane over the Potomac many years ago



Officers of the tractor division—Lieutenant Long, Major Morgan, Capt. E. A. Earle, Capt. E. A. Sullivan, Capt. E. H. Chase, and Lieut. B. S. Pfeiffer

Board. It was a clean-cut, logical statement of the work that America has accomplished in the last year, in aircraft production, starting, as he stated, from minus zero and in one year's time attaining the point where America is ready to assume the world's lead in quantity production of aircraft.

An idea of what the Navy is doing in air work was given by Mr. Coffin when he said:

"When you consider that they are flying, as an everyday proposition, aircraft weighing up to 11,000 and 13,000 lb., some of their new stuff going to 13,000 lb. in weight, equipped with 1200 hp., and are doing it as a regular matter of course, carrying crews of five men, it is some accomplishment. Last week they took two of these Liberty motors, 'that won't run,' put them in a stock boat, flew it up and down the river a couple of times and then made the trip of 280 miles from Philadelphia to Newport News without missing a shot on either motor. They are making daily trips from Newport News to Washington, and we hear nothing of it. It must lead all of us to wonder just what the limit in aircraft will be. The army is also at work on machines of approximately an equal size, but the Navy, because of their work in the detection of submarines, have been forced immediately into the large-sized construction."

150,000 Men in Training

Referring to the statement that was made on the floor of the Senate that one airplane had been produced at a cost of \$640,000,000, Mr. Coffin said that only between about a third, and a half of the appropriation has actually been spent, and there has been built from 6000 training machines and 2000 machines in Europe. There are 150,000 men in training in the aviation service in this country at the twenty-five or thirty big training stations, in addition to the experimental laboratory at McCook field, which is one of the most remarkable

developments of the whole air service.

"Perhaps the greatest good that could come out of all the recent investigations is that the theory that it is impossible to produce standardized airplanes in quantities has been exploded," said Mr. Coffin. "When the crates of planes are received on the other side, it is not necessary to match up the different parts in the same way they were put together in this country, because the parts are interchangeable.

"It has taken time to do all this and to get out the necessary tools, jigs and fixtures for the work. You have also heard the foolish suggestion of bringing to this

country an engine which has been tried out and found good in Europe, but you know it is impossible to get into production on a foreign type of airplane engine in less than a year.

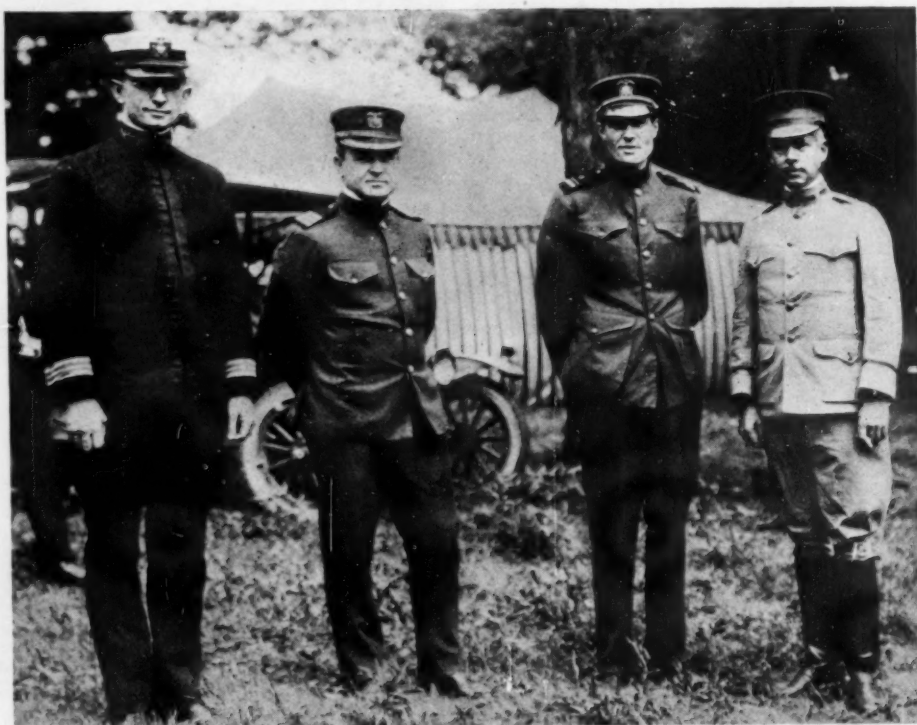
"Although the drawings, equipment and even the engineers were brought over from the other side, we have but to point to the example of the Gnome engine at the plant of the General Vehicle company and to the Hispano-Suiza at the Wright-Martin plant, some of which were over a year behind the specified time in delivery."

The technical talks at the sessions of the meeting concerned themselves to a considerable extent with aviation questions. Two of those which created most interest were one by W. B. Stout, formerly on the staff of MOTOR AGE but now technical advisor of the Aircraft Board on "Present Day Problems in Aeronautics," and another by F. L. Faurote, entitled "Airplanes of Today." This with lantern slides illustrated the development of the airplane and was valuable as a historical document. Mr. Stout's talk answered much of the criticism that has been directed at the Aircraft Board and in it he made the observation that research was but a way of wasting money intelligently.

Germany in the Air

F. G. Diffin, one of the delegates of the S. A. E. to the International Aircraft conference in London last February, declared that as a nation we under-estimate the fighting strength of Germany in the air. It is foolish to think of Germany as in a state of exhaustion, according to Mr. Diffin. Germany appreciated years before the war started that aerial warfare would be one of the determining factors and prepared for it.

A discussion on heavy-oil engines, by C. E. Sargent and P. L. Scott, and a demonstration of petroleum refining with lab-



Naval constructors—F. G. Coburn and N. S. Westwelt and Lieut. J. L. Beeze and Major G. R. Wadsworth of the Naval Aircraft Board, Philadelphia, Pa.



At the left is shown a 10-ton Ordnance tractor, while at the right is one of the quickly developed 5-ton Ordnance tractors. Note the camouflage of both machines

oratory apparatus were two of the features foreign to aviation proper.

Fighting apparatus on exhibition was not confined wholly to the air, as the Ordnance department gave a demonstration of what its trucks and tractors could do in the way of hauling heavy loads through trick woods, up steep grades, etc. The units on exhibition included the 5-ton and 10-ton types of track-laying armored tractors, track-laying and wheeled trailers, artillery repair trucks, reconnaissance and machine gun cars, staff observation cars and the ordnance design of 3-ton truck tractor. Some of the artillery equipment which went with it was also shown, including 3-in. guns, etc. These machines were all from the Ordnance experimental field and were simply typical of a large number of other ordnance types.

Developed by Ordnance

To clear up any misunderstanding of the relative functions of the vehicles issued by the Ordnance Department and the Quartermaster's Corps it may be said that in general the Ordnance Department's vehicles are issued to the field artillery, are driven and handled by field artillery soldiers and usually are types that are more at home where there is no road than where there is one.

The vehicles issued by the Quartermaster's Corps, on the other hand, usually are intended for general transportation purposes, are generally handled by Quartermaster's Corps men and operate on reasonably good roads in the rear of combatant troops. The Ordnance vehicles are definitely assigned to their guns at all times.

The artillery repair truck is a standardized machine shop furnished to motorized batteries of field artillery, to ammunition truck companies and to the smaller mobile repair shops. The general equipment includes a gasoline-driven generator to furnish power, a lathe, a drill-press, a grinder, air compressor, blacksmith's outfit, etc., with complete tool equipment. The equipment repair shop is similar but is supplied with machinery and tools to repair the machine guns, artillery, harness and infantry equipment, etc.

The 3-ton truck tractor was developed by the Ordnance Department to meet the

demands of the field artillery in France for a very powerful four-wheel-drive vehicle for taking guns long distances on good roads at high speed, where the services of a tracklaying tractor are not required. It is equipped with capstan and sprags and has a four-wheeled steer, giving short turning ranges. Wherever possible, parts already in service on Ordnance Department vehicles or those used by other departments are employed to simplify the spare parts matter.

A typical example is the use of the Wisconsin engine in a great many thousand other ordnance vehicles and the ease by which the vehicle can be made a four-wheeled steer, for the use of tractor, or a two-wheel steer, for the use of the truck, by simply interchanging axles. The 5-ton tractor is intended for hauling guns of medium weight at a speed of about 6 m.p.h., though in an emergency it is able to do 12 m.p.h. The design in placing this vehicle in production constitutes a record for a vehicle of a new type. It was first

definitely decided that the type was necessary on Nov. 24 last. The available preliminary designs were rushed during the months of December and January and the first experimental tractor was produced in twenty-seven working days in January. The total elapsed time from starting the design work to demonstrating the tractor in production to the Secretary of War was only a little over six months. It is of the track-laying type, but its details are not permitted to be published at this time.

The 10-ton artillery tractor is similar in design to the 5-ton, but is approximately twice as large and intended for hauling heavier loads. This is the first of the standard tractors placed in production by the Ordnance Department, and the early models run back as far as 1915, when the first modified commercial tractors were tested.

The engine and gasoline tank and other vital parts are protected by armor in the track-laying tractor, but the operator is exposed to fire.

Present-Day Problems in Aeronautics

By W. B. Stout

Technical Advisor Aircraft Board

IN attacking any problem for action and for real results three steps always are necessary.

First, one must know what to do.

Second, he must find out by research and analysis how to do it.

Third, by organization and executive control he must do it.

No one of these three divisions can be left out and still get really efficient action.

When the war started America, owing to the patent situation, had small knowledge of aircraft, aircraft design or aircraft manufacture. The firms operating were few and of small talent. To enter the airplane business at that time was merely to invest in a lawsuit.

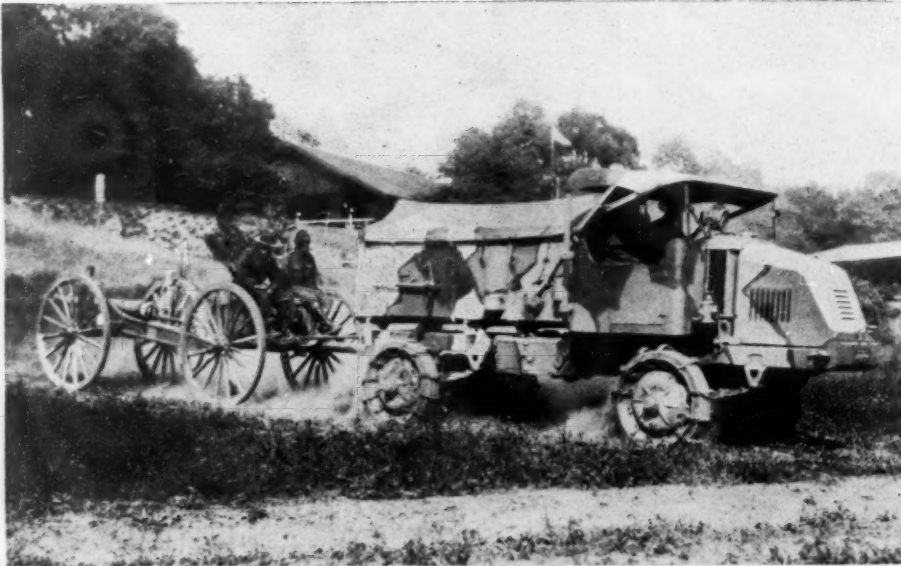
Europe having been at war for some time, had developed fighting aircraft, regardless of hindrances, and had seen too a certain amount of strategic possibility. In the time available there was no opportunity for us in America to learn, more than in a perfunctory manner, just what it was we had

to do. The nation and some of its patriots were confronted with the problem of handling all three divisions of action at once, being actually organized and doing the job at the same time that they were learning what they had to do, and further getting their first education as to how to do it.

With all this in view and the confession of a colossal ignorance, not of anybody but of everybody in America so far as aircraft were concerned, it is a great credit to those who finished the first stage of aircraft production for war that they could do so tremendous a job in so short a time.

When one remembers that within one year a mushroom organization was confronted with the task of spending judiciously more money than was spent on the Panama Canal in eight years, one has a vision of what a real man's job this was.

When one adds to this the tremendous inefficiency forced upon the organization by past congressional acts, which bound every movement with red tape and suspicion, he



The new four-wheel-drive Militor tractor and the 75-mm. French gun made good speed in the demonstrations. The art of camouflage also is used here

sees the task three times as hard to accomplish as though the work could have been done under industrial methods of centralized trusted authority.

That to date in the aircraft program we have accomplished almost the impossible does not by any means prove that our problem is solved. We have spent the time to date learning what aircraft are and how they are being built in Europe. We have had little, if any, time to absorb the necessary lessons relating to production and shipping requirements which as we have them, are different from those of our Allies abroad.

With the present type of airplane construction—an attempt to copy foreign designs requiring foreign types of labor—we may never be the help to the Allies in the air that we wish to be. If America is to produce the cloud of ships which she has promised herself to put into the air, other means must be designed for building aircraft than those now existing.

Aircraft design can be divided into four major branches:

First, aerodynamics, or the air theory of the plane.

Second, structure, which has to do with the materials and strengths of the different parts.

Third, mechanical arrangement, which is coupled very closely with both.

Fourth, production design.

A fifth, known as accessory design, might be added.

Aerodynamics, in its fundamentals, is very simple. There is no final necessity for complicated mathematics in working out airplane problems.

Center of Wind Pressure

If one advances a flat plane against the air, as in Fig. 1, the center of wind pressure C will be at the center of the plate P. If this same plate, however, is tipped at an angle and sent forward against the wind, the center of pressure will move forward up against the leading edge. Since to support an object one must lift it from its center of gravity, this plane at an angle will not support itself, since the center of the weight of the plane is at CG or the center of the plate, while the center of pressure CP is at the front. This will cause the rear end of the plate to fall, and instead of flying through the air, it will whirl about and fall without support.

As an illustration of this try to push a floating board under water with a stick. If

we push down near one end of the board, that end will be forced into the water while the other end will still float so that the stick will slide off the end of the board. If we push to one side or in front of the center of displacement or flotation, the board will go under the water only at the point on which we push, but if we place the stick at the center of flotation of the board, we can push it entirely under the water from this one point of support.

In an airplane, there can be only one center of lift and one center of gravity, so that for free flight and proper balance, these must coincide. Thus, in order to make the plate support itself, either the center of gravity must be moved forward by adding weight to the front edge of the plate until the CG coincides with the CP, or tail surface area must be added at a negative angle to bring the CP back to the CG. For all flight, it will be seen that the center of weight must coincide with the center of wind pressure or lift. In an airplane, in order to obtain flight, the wing surfaces at

the front must attack the wind at a certain angle, known as the angle of incidence, shown at X in Figs. 2 and 3. If left to themselves, the wings would not take this angle, but would merely travel through the air undirected, as does a stick or an arrow. To give them the proper angle of incidence the tail surface T is given a negative angle, so that when T travels horizontally, the lifting or wing surfaces will be tilted at the certain angle of incidence X to give them lift.

Aircraft must be designed for specific uses. If one is going to build a boat, the designer decides how fast he wants it to go, and how much load it must carry. Immediately he finds that a compromise is necessary, for if he builds a hull to give maximum lift or cargo capacity within its dimensions, he has lost speed possibilities and has produced a slow-going craft. On the other hand, if he designs for speed, there comes immediately the problem of reducing the weight of all parts, fuel and cargo, in order to get sufficient flotation within the dimensions that are required for speed. The same analogy holds in present-day aircraft, and the wing curve of a plane is a fairly decent analogy to the boat. A deeply cambered or curved wing, of fairly thick section, gives great lift at steep angles, and is ideal for weight carrying. This type of wing curve is shown above in Fig. 3. If, however, one designs for speed, he selects a wing better stream-lined and which disturbs the air less at flat angles.

Remember that at speed the pressure on the wing becomes greater per unit of surface area, and as the pressure becomes greater, the plane flies with a smaller angle of incidence.

Speed Wing Curve

Thus, when the heavy lift wing shown in Fig. 3 gets up to speed, it takes a smaller angle and offers at once a great deal of resistance to forward travel through the air. To try to make a wing of this curve travel at speed is just as sensible, as I have said before, as to attempt to crowd power onto a canal boat and turn it into a racing yacht. The addition of power will do nothing but pile up a bigger wave in front of the ship and will add almost nothing to its speed.

This has been proved in certain types of planes; we have replaced 400-hp. engines by 200 hp., but as a result of double the thrust,



A part of the crowd that watched the Ordnance tractors climb hills and perform other difficult tasks during the demonstrations at Dayton

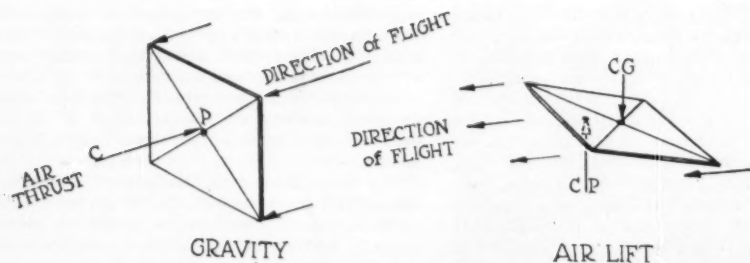


Fig. 1—To demonstrate that center of wind pressure on a plane and the center of gravity must coincide for the plane to fly.

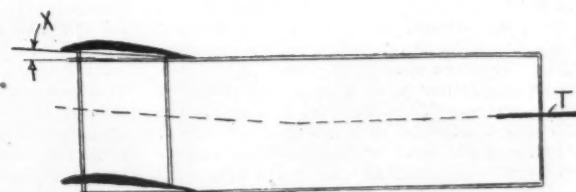


Fig. 2—Tilt of wing surfaces of a plane at the angle of incidence when the tail surface travels horizontally

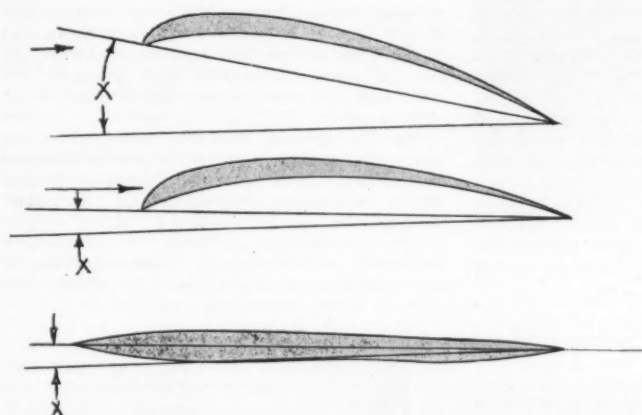


Fig. 3—Deeply curved wing for great lift at steep angles and weight carrying, with streamline wing for speed at bottom

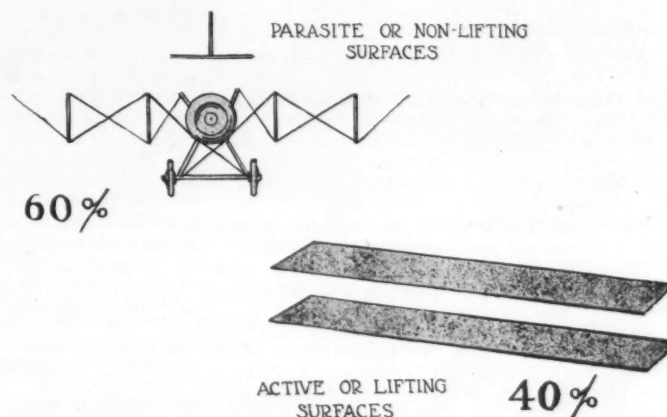


Fig. 4—Parasite airplane parts, necessary for structural or operating reasons but adding weight and resistance without lifting

the gain in speed was only 3 or 4 m.p.h. As a contrast to this, we have taken the same engine in a much heavier plane, but fitted with a speed wing curve, and have driven it at tremendous speeds.

This brings up one of the earliest ideas which was used to design planes for speed, and which was mentioned before the society last year by one of the speakers from abroad. Although the heavy-lift type of wing cannot be driven to speed by the addition of power, yet the speed type of wing can be driven to greater lift by one of two methods, first by increasing the flying speed, which means landing speed, and second by adding greater area to make up for the loss per square foot of lift.

Racing planes, rather than having clipped wings of heavy lift, tend toward large wing areas and light loading, but with the nicely stream-lined wing curves shown in Fig. 3.

Increase of Weight

In adding this wing area one must also add more wing area to lift the weight of the wing area he has just added, which is the equivalent almost of a dog chasing his tail. The additional weight per square foot in the wing is around three-quarters of a pound, yet, on account of the extra weight of this new wing surface also, one must figure a weight of $1\frac{1}{2}$ lb. per square foot for all the wing surface added.

Addition of weight on the wings, however, is not of much tremendous importance if one does not increase the flat-plate or parasite resistance, a point that I will explain later.

If the designer increases the weight, however, of the engine or body, known as the fuselage, he must add 3 lb. to his total for every pound of additional engine weight; either in extra wing structure, extra tank weight or fuel weight, or added truss. These figures are, of course, structural figures, but I give them to show how closely structural, all the way through, are connected with the

aerodynamic considerations, and that in changing the aerodynamic features one cannot for a moment forget the structural fundamentals that he must follow.

By developing the idea of increased wing surfaces and greater penetration or speed possibility on the part of the wing curve, we have been able to build airplanes of such wing efficiency that the wings have now become one of the least points of resistance at high speed, for the parasite resistance is dominant.

Fig 4 shows the so-called parasite parts of the airplane. These are the parts necessary for structural or operating reasons, but which offer resistance to forward travel without adding to the lift or support of the plane. They include struts, wires, landing gear, radiator, piping, exposed control wires, pulleys, body, tail surface edges, tail skid, and things which to the layman seem so trivial as to warrant no real thought. In a speed plane, however, the exposing of a water pipe from the engine to the top wing might slow down the maximum speed of the plane 5 m.p.h. Adding stream-line wires in the place of round cables might add 10 m.p.h. to the speed of the machine.

In speed planes today, at maximum rate of travel, more than 60 per cent of the engine power and gasoline consumed is used up in forcing these parasites through the air, and only 40 per cent of the horsepower is usefully used. It is as though a speed boat going through the water, and having a beautifully stream-lined hull, should be forced to run a race with a log dragging behind, or like a car in a race with the emergency brake set the whole time, wasting power for nothing.

The greatest problem today of the aeronautical engineer, both as to aerodynamics and structure, lies in the elimination of the parasite, or as the British call it, flat-plate resistance.

While the airplane today contains essen-

tially the same units of structure as in the beginning, yet the mechanical arrangement has varied as new engines, materials and processes and greater experience in flying have shown the way. The early two-propeller pusher with exposed pilot and no body construction gave way to the single-propeller pusher type with the pilot seated in front of the engine. In case of a spill, however, or a bad landing, the engine had a nasty habit of coming forward through the pilot before striking the ground, for which reason particularly this type of machine was gradually discarded. Another deficiency of this arrangement was made in case of propeller breaking, which happened on the small-engined machines of the early days, the pieces of the blade were likely to cut off the rear tail structure and bring the pilot to serious grief.

Then came the tractor type of plane first shown in the Nieuport monoplane with the engine and propeller in front and the pilot just back of the wings. This type of plane has passed through a high state of development in all sizes within the horsepower limitations of one engine.

Mechanical Arrangements

With the next new mechanical arrangement first principles were used, two propellers being placed out on the wings and pushing the planes. The engines were directly connected to the propellers, and were fitted on the wing. This later gave way to a similar arrangement of the engines but with tractor propellers in front of the wings. Recently we have had planes fitted with many engines distributed over the wings, each with its separate propeller. Some of these machines weigh as much as fifteen tons.

Outside of engine and propeller location there are three general mechanical arrangements of these tractor planes: Monoplanes, biplanes, and triplanes. These types are so well known as to need no further descrip-

tion. The monoplane aerodynamically is the best type of design but constructionally it is to date almost impossible. Requiring double the area in one wing for the propelling of the same spread of wing, the monoplane must either have a wider spread or a deeper chord. This decreases the aspect ratio and hence the aerodynamic efficiency. To increase the span of the machine, means structural difficulty, as the spars can only be as thick as the wing section will allow and beyond a certain span this construction cannot be built with the factor of safety required in the air. Efficient monoplanes, therefore, are ordinarily flimsy and dangerous for quick evolution, having less space and heavier wing loading than the biplane on account of structural limitations. As a result, they have a considerably higher landing speed, which again makes them dangerous except for the most skillful of pilots.

A big disadvantage of monoplanes in war is the tremendous blind spot under the wings, where the pilot can see absolutely nothing. He can see everything above and out to the horizon, but nothing below him. The parasol monoplane developed with the wing above the fuselage so that the pilot can see beneath and above, gives excellent vision but compromises with center of thrust and head resistance in such manner that it is still of doubtful value.

Structurally the biplane is superior and is far less in weight per square foot, but again there is a difficulty of vision. Although the pilot can see more below, since he is farther up from the lower wing and has a narrower wing chord to hide his view, he has a second wing above him which slightly hinders his view, enabling a plane to dive on him from the front along a certain line without its being seen until it is close at hand.

Like a Ship

Every blind spot on a machine is dangerous, especially in bombing machines or combat types, because the Hun pilot spying a machine from afar and seeing you first, knows from the make of the machine just where the blind spot is and how he can sneak up under it or around to one side in such a position that he cannot be seen until he opens fire. In formation work one is not permitted to circle around in order to retain his vision in all directions. Over enemy territory, it is important that the pilot keep his place in the formation, traveling and reducing speed with it.

A man in a formation over enemy territory who misses his place in the line and for any reason falls behind is much like a ship, which in a convoy crossing the Atlantic has engine trouble and falls away from the protection of the battleships and destroyers. One never knows when a speed

scout flyer is hiding in a cloud. The Huns follow a formation fleet cross-country as submarines follow a convoy and pounce at once upon any plane that drops behind to an unprotected position. If one flyer on the fringe of the formation can by attack be forced to dive away from his fellows, he is immediately at the mercy of the Hun scouts who will not come too close for fear of receiving the combined machine gun fire of the squadron. If there is a blind spot in the machine, it is possible to force it out of formation.

To permit better vision and also in an attempt to decrease head resistance by the elimination of struts, the triplane has been used extensively. In this type the wing span can be fairly narrow, enabling the machine to land in confined places. The wings are so narrow that the pilot's view is almost complete while the tall construction is small and short, allowing greater agility for air flights and less chance of the enemy flyer hiding where he cannot be seen.

There is no decision as yet as to which is the best type, but in analyzing present-day problems one can suggest the following lines of experiment with each type of machine:

1—How can we overcome the visual and structural disadvantages of the monoplane in order to acquire the aerodynamic advantage which we must admit the bird type of plane possesses?

2—How can we develop the biplane for less parasite resistance and greater vision, although this type is today in a higher state of development than any other?

3—How can we obtain greater aerodynamic ability of the triplane to fit the decided structural advantages which it possesses?

We may thus run the gamut of experimentation from aeronautics to structure and back again in these three types of planes alone. And there are others unthought of.

Following this discussion of present possibilities and requirements in airplanes for war and of the next steps to fit what we know to the requirements of today, it is worth while to look ahead to see what the future offers in the eventual development of aircraft. In the development of the automobile not one-hundredth of the money per month was spent in perfecting models and ideas that is now being spent on airplanes. New automobile models were brought out annually and were in the experimental stage for months.

New airplane models must also go through these months of experimental work, but on an average new models and types are taking precedence on the battle front every eleven weeks.

The automobile industry has developed materials and processes, parts and types of organizations through years of effort. In

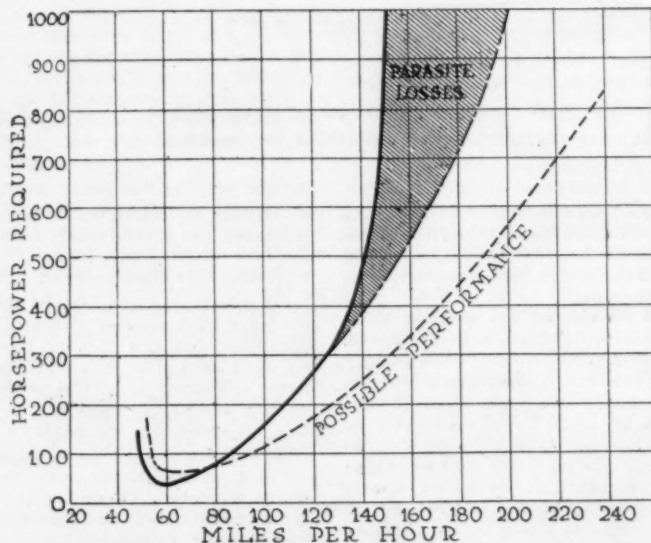


Fig. 5—Losses due to parasite airplane parts, theoretically possible performance and horsepower required at various speeds

FOR SAFETY MUST LAND -
1. IN SMALLEST SPACE
2. ON ROUghest GROUND
3. AT SLOWEST SPEED

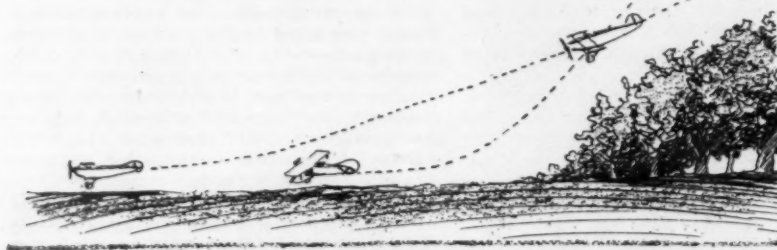


Fig. 6—Comparison of landing of high and low-speed plane types

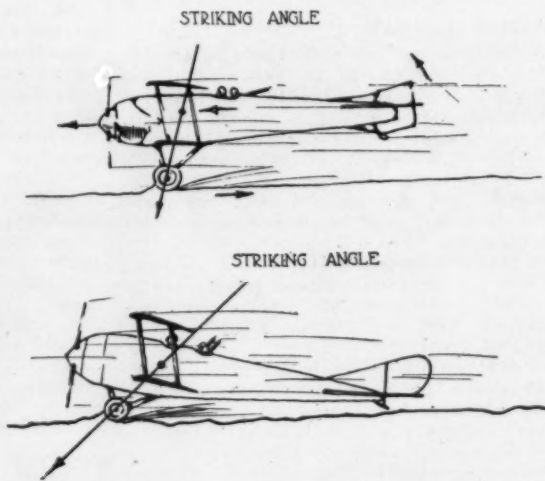


Fig. 7—Difference in striking angles of planes with high and low centers of gravity

developing aircraft we have all of these related industries and organizations to draw on for knowledge and material. We are thus able to move in development work five times as fast as was possible with the automobile, a fact which is worth more than passing thought. This means that the man entering the aircraft industry today must think five times as fast as the automobile executive, in order to keep up with the industry, and that an engineer must have five times as much vision and mobility of mind in order that he may keep his place in progress.

A very fine line must be drawn between conservation, as we have known it in other industries, and what we call conservatism in the aircraft industry. What would be reckless judgment in established industries might well be ultra-conservative judgment as related to aircraft design. It is largely for this reason that during the war period the business man of the old type has been so quickly eliminated from this new industry in favor of that type of man who thinks quickly and fast, and is willing to take long risks, trusting to his own judgment. This type of action necessitates great mistakes as well as great successes.

The British air board, for example, was changed five times in the first year of its existence, largely, we are told, because the industry grew faster than the vision of the men then in the air board could follow. This work is now entirely in the hands of one man, and a man of quick acting vision and definite commercial experience. That our own program is taking similar form, so far as organization goes, is one of the most encouraging items of today.

This type of vision naturally requires that research follow every available idea, and research is but a way of "wasting money intelligently." Tremendous sums can well be spent during the next few years in developing aircraft for war, remembering that a day of war saved means a gain of \$50,000,000 and six thousand lives.

Five Miles a Minute

With these ideas in mind it would be well to conclude this analysis with visions as fanciful as we can summon to mind, which still are based on sound engineering judgment. From this viewpoint I predict that operating speeds will exceed 5 miles a minute in airplanes before we can call aircraft really developed machines.

I have discussed the parasite or flat-plate resistance as being a fundamental defect of aircraft. Fig. 4 shows the parts that at high speeds now form the greater part of such a loss.

The solid area in the curve, Fig. 5, shows approximately maximum performance to date. The ordinates indicate the horsepower required; the abscissas designate the miles-per-hour of speed. It is evident from this that above a certain point additional horsepower does not give an equivalent addition in speed, so that even should we double the horsepower of engines of the same weight we would not materially increase the flying speed of a plane as built today, although we could reduce its landing speed.

It is possible to operate wing sections efficiently at a speed of 8 miles per minute, as is proved by propeller tips on machines flying at present. These tips in our Liberty planes travel 8 miles per minute, and their efficiency is nearly 85 per cent. There is no reason, from a pure engineering standpoint, why curves in the form of wings cannot perform equally well. The fundamental difficulty is in landing, for although it should be possible to build a machine today to fly at almost any speed we want, yet the landing problem is so great as to make real speed prohibitive.



At the extreme left W. B. Stout watches a Liberty engine perform, while next to him stands Fay L. Faurote, who also read a paper on airplanes. Lieut. M. Miozzi is shown in the uniform of Italy. F. G. Diffin, one of the delegates to the International Airplane Congress in London, is at the extreme right

If we learn from the German long-distance gun, which sends its shell up from the earth to a point where the atmospheric resistance is negligible, we may also send airplanes to equivalent altitudes, with special engines developed for that work, and thus in a much lighter medium, with less resistance, obtain our speed range. This will require the solving of many problems. It will mean new propelling apparatus, or propellers. It may even mean special fuels to be used at altitude.

There are various ways of attempting the problem, and as we are gaining experience through actual work at 20,000 ft. and over it, it is possible and even, in my opinion, probable, that long distance travel in the future will take place at altitudes more than 5 miles above the earth's surface. It is as though a ship on the ocean could pick out for itself water of varying density, so that for speed work it would take a medium of less resistance, or, to use another analogy, it is like the sea plane, which when its operator really wants to travel fast, rises from the water and ascends into a lighter medium, even though this lighter medium requires greater supporting area. In altitude work, however, this necessity for greater area will be compensated for by the greater speed, which is the fundamental desire.

And so we come to the problem of landing. As soon as we have a plane that we can force to travel at high speed—see the dotted possibility line of Fig. 6—landing will become a dominant problem. We ordinarily visualize safety in landing as depending on speed alone, but speed is only one of the elements of safety. That real safety may be had three things are necessary:

- 1—To land within the smallest possible area.
- 2—To land on the roughest possible ground.
- 3—To touch the ground at the slowest possible speed.

Eventually airplanes will land almost in their own tracks, much as a pigeon lands on a window sill or a sparrow on a wire.

It is by no means proved that our present method of landing airplanes is the final one, and intensive study should be put on the development of new landing systems and

schemes, that greater things may be accomplished.

In analyzing landing and any one factor concerned with it, the other fundamentals should be kept in mind. Modern speed planes, for example, landing at 50 m.p.h., need a large field in which to alight, on account of the angle at which they come down and the distance they roll after striking the ground. The airplanes used in the early exhibition work flew from and landed in ball parks and four-acre lots in comparative safety. Present-day machines cannot do this on account of the necessity for speed.

Here is a thing that we know can be done, and efforts should be made to increase the landing capabilities and safety of existing planes. All three landing fundamentals require separate study.

Speed in Landing

Speed in landing is largely a question of wings and their loading per square foot. A plane, with a heavily loaded wing lands at a higher speed than one with a lightly loaded wing. A plane that leaves the ground at low speed is generally hindered in its high-speed; it is too fast to fly only when it lands at a speed too great for safety. Flying at a high speed, once in the air, is not a problem but an advantage.

If landing speed can safely be increased, then the maximum speed of the plane can be increased in proportion.

Planes with small surfaces in proportion to their weight glide at a steep angle and come down fast. After they have touched the ground, however, their air resistance causes them to stop quickly.

Planes with light wing loading "float" easily, coming down at a flat angle to their landing place. Although they touch the ground at comparatively slow speed, they roll a long distance before coming to a stop, and must travel a considerable distance before they first touch the ground.

I was interested in seeing a landing made not long ago by a pilot, who, unused to a machine of light wing-loading, had a plane of the "floating" type out for the first time. He made a beautiful landing in the center of the field, at a higher speed than the plane was designed to land at, although at the

(Concluded on page 33)



Sending away the second man in the 100-mile handicap at Chicago, which was won by Chevrolet

Chevrolet Victor at Chicago

Drives Frontenac 100 Miles at 107.9 m.p.h.
—Resta takes 10-mile

CHICAGO, June 22—Louis Chevrolet captured premier honors in the fourth annual Chicago derby on the 2-mile board speedway to-day, when in a hotly contested race he won the 100-mile handicap event, which featured the day's program, at a speed of nearly 108 m.p.h. His Frontenac did the century in 55 min. 29.60 sec., an average of 107.9 m.p.h., breaking the previous track record for the distance of 55 min. 50 sec. made by de Palma in the Peugeot two years ago.

Mulford in another Frontenac took second, finishing 1 min. 38 sec. behind Chevrolet, with Vail's Hudson third nearly a minute later. The other five to register at the finish followed in the order named: Hickey in Hudson, Oldfield in his Oldfield Special; Akley in the Bender, Milton in a Duesenberg, and de Palma in a Packard.

Ten-Mile Handicap

The 100-mile event was preceded by a 10-mile handicap run in three heats, which turned up Resta as the winner at a speed of 108.7 m.p.h., his time being 5 min. 33.1 sec. for the final heat. Chevrolet got second and Oldfield third. The two preliminary heats went to Resta and Chevrolet.

Between the two events de Palma put his Packard around the track in a successful trial for the track record for one lap. In this he made a speed of 116 m.p.h., bettering the best previous record for the track, set up by Resta two years ago at 113 m.p.h.

With two records to its credit the meet can be considered a success from the speed standpoint. Chevrolet's time for the 100 miles is not as good as the record he es-

tablished at Sheepshead Bay speedway last fall, so no new American record was made. Chevrolet now holds the American record for this distance at New York and Chicago both.

To-day's race proved the possibility of getting out a big crowd even in these war times. But it was only done by adopting

baseball tactics of popular prices and late starting. Prices were very much reduced from those of early races on this speedway: \$1 admission, free parking spaces and \$1 grandstand seats. Instead of the 2 o'clock start the starting bomb was fired at 4 p. m.

That these arrangements were wise is



The getaway in the final heat of the 10-mile handicap

Order of Finish in 100-Mile

DRIVER	HANDICAP	CAR	TIME	SPEED
L. Chevrolet.....	15 sec.	Frontenac.....	55:29.60	107.9
Mulford.....	20 sec.	Frontenac.....	57:07.20	105.4
Vail.....	75 sec.	Hudson.....	58:14	103.3
Hickey.....	70 sec.	Hudson.....		
Oldfield.....	40 sec.	Special.....		
Milton.....	50 sec.	Duesenberg.....		
Alley.....	75 sec.	Bender Sp.....		
De Palma.....	Scratch	Packard.....		

De Palma made record lap in 1:04, or at 116 m.p.h.

shown by the fact that fully 40,000 witnessed the meet, a crowd exceeded only once at the speedway and that the day the track was inaugurated three years ago. Over half the track was lined with double rows of cars in the infield, the biggest turnout of cars ever seen at one time in Chicago.

It is doubtful if another such crowd could be brought out for another long-distance handicap race, for with fifteen contestants it is hard enough for the spectators to follow the fortunes of the individual drivers, without, as in this case, starting them out at different times. With the scoreboards two laps or more behind, the difficulties of keeping tab on the contestants are increased and the interest is lost. Handicap races should not be over 20 miles. With a 100-mile handicap the starting spectacle is lost and the speeding of the leaders in the first few laps for leadership is also lost.

High Lights in Day

It is not an easy thing to follow a 100-mile handicap race with so many starters even from the grandstand, but there were certain high lights of the main event of the day which, as in all races, make the real story of the race.

De Palma played in hard luck again. The favorite of the grandstands and scratch man in the handicapping, starting fifteenth, he had at 15 miles his Packard in sixth place and was making the best speed of all. Then he was forced to spend nearly 4 min. at the pits changing spark plugs. When he got under way he reeled off the laps to the tune of 109 and 110

m.p.h. in the effort to make up the lost time. But the others had gained too much on him and toward the last his terrific speed seemed to tell, for Chevrolet and Mulford during the last quarter of the race maintained their distance from him.

Resta lost to-day his distinction of never having lost a race on the Chicago track. He was given 30 sec. handicap over de Palma and was climbing into the lead when after the first 30 miles he came in to the pits to change spark plugs. Later he made a second stop with a broken accelerator spring and a third and final when he withdrew with oiling trouble.

The specially imported Duray, holder of the world's straightaway record, also ran but not well enough to show.

Twelve cases of pit stops were recorded during the race. Six were for faulty ignition from fouled plugs. De Palma made his first stop early in the race and required 3 min. 10 sec. to replace fouled plugs. Before this McCarthy driving the Hoskins was declared out from faulty plugs. Percy Ford in the Duesenberg drove to his pit after a few laps to make minor adjustments and shortly after him came Milton to change a right rear shoe. His was the first case of tire trouble.

The next man to come to the pits was Duray, who evidently did not understand all the subtle qualities of the Frontenac. His trouble also consisted chiefly of over-oiling of the plugs, although he did some experimenting with the carbureter while at the pits and from this time on seemed to be running better.

Three minutes after he got away Resta

came to his pit and a diagnosis of his trouble resolved itself into fouled plugs. He stopped 10 min. to change plugs and this put him hopelessly out of the running, although his car was going strong. On the next lap he again halted at the pits, this time to put in a new throttle spring, the other having broken, prevented the throttle from closing on the turns.

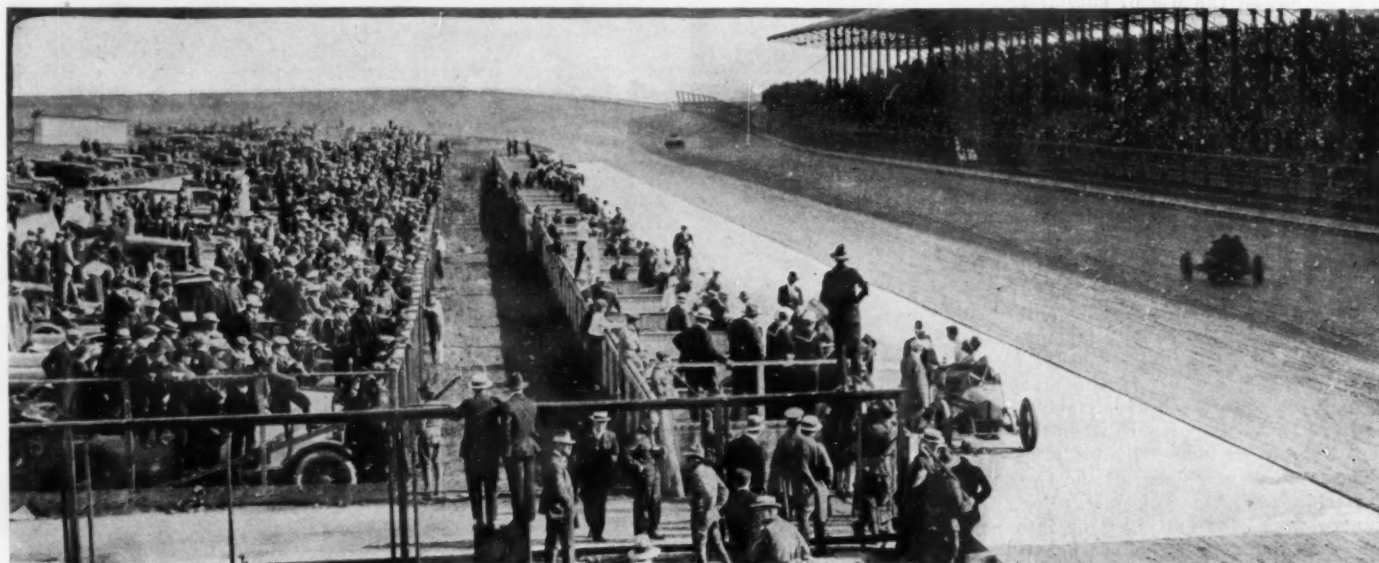
The eighth man to turn in was Ford, with a left tire in need of replacement. One minute after him came Milton, who changed a right rear shoe the same as he did before. A noticeable factor up to this time was the slowness of the pit work. Tires were not changed as rapidly as in some of the other Chicago races. When the race was about half over Resta again brought his car to the pits and this time retired permanently. He was troubled with fouled plugs and his oil pump plunger operated by the mechanic was put out of commission. With the oiling system inoperative, he could not go on. About this time Alley, who had been going well, drew up to his pit for a tire, and this forced him to finish sixth whereas he might have been among the leaders had he kept going.

Trouble with Plugs

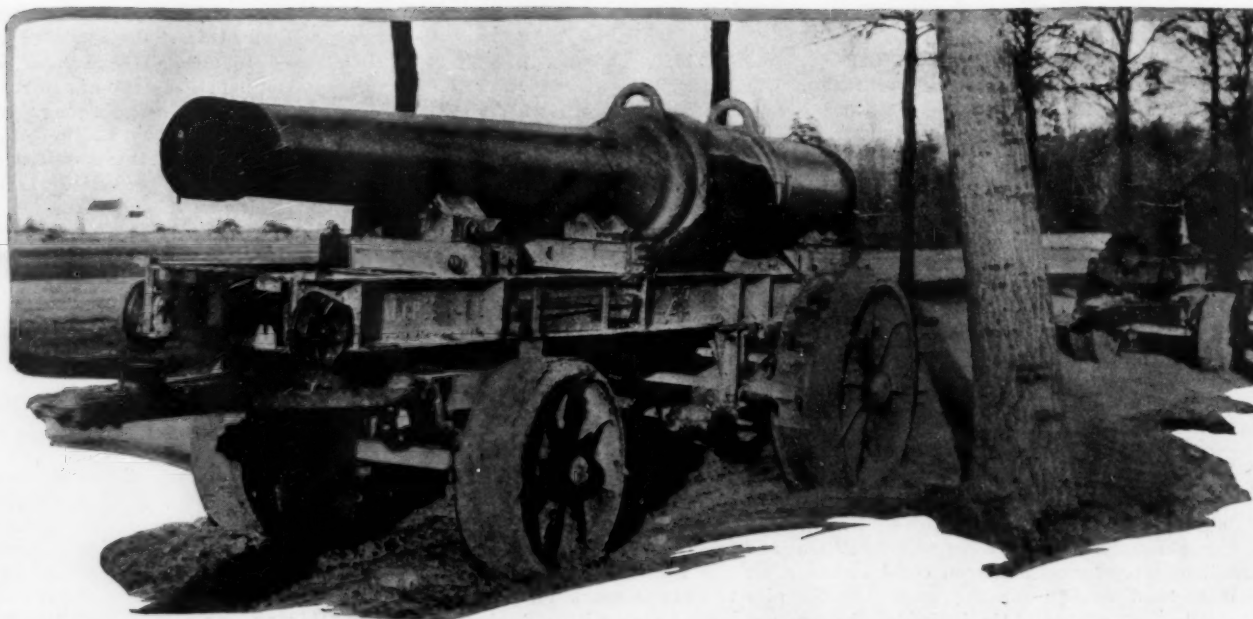
Omar Toft in the Miller Special had his trouble in keeping the oil from fouling plugs and was finally forced to the pits, only to remain there while the leaders fought on.

All told there were but four tires replaced; quite remarkable when considering that the track was cut up and splintery. Only two of the four tires changed were actually cut to pieces, the others being changed by the drivers only as a matter of precaution. De Palma, after breaking the track record, changed all tires.

Resta's tires were specials, being intended for speedway and beach work. His car appears light and thus probably is very easy on tires. Practically all the drivers used Goodyear cord tires, except Oldfield, who had Firestones. The latter were also on Fetterman's Peerless. All cars had Rudge-Whitworth wire wheels and Hartford shock absorbers.



A view of the crowd in grandstands and back of pits. Two cars have stopped for pit work



One of the Allied big guns mounted on a special trailer and hauled by a gasoline tractor

Special Tractors for Big Guns

By W. F. Bradley

Special Motor Age Correspondent with the Armies in France

EUROPEAN military authorities are so jealous of the condition of their roads that every effort is made to prevent their use by creeper tractors, by vehicles with straked wheels or even by trucks with chains on their wheels. It is not always possible, however, to keep such vehicles off the road at all times, though great care is taken to see that creeper tractors do not travel unnecessarily over hard roads and traffic police have instructions to cause chains to be removed when the condition of the road does not warrant their retention.

Special Tractors

Because of the destruction done by creeper tractors on made roads, there has been developed the use of special trailers capable of receiving a creeper, this trailer being towed by a rubber tired four-wheel-drive tractor. There is a double advantage in this. The rubber-tired tractor easily can average 10 m.p.h. on good roads, while the creeper rarely makes 3 m.p.h. The destruction of the road surface by the rubber-tired tractor is very slight, while that of the self-track laying machine is considerable. Obviously, this trailer is only made use of for long hauls, during which hard roads must be traversed. A change of position involving a journey of 30 miles will occupy 10 hr. with a creeper tractor, while the same distance can be covered in not much more than 3 hr. if the creeper is hauled by a four-wheel-drive tractor. This is of the utmost importance when gun positions have to be changed rapidly.

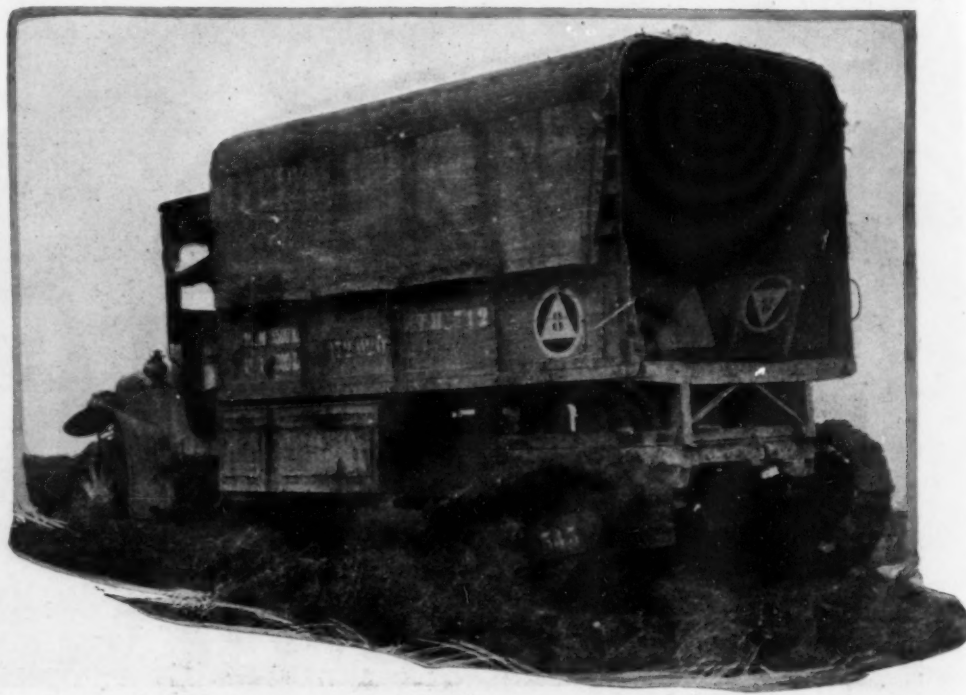
The fields of usefulness of the two types of machines are quite distinct. For cross-country work, for getting guns into position, for dirt roads, the creeper type is supreme. But as soon as the gun has been removed from this environment and has

to operate on highways, the full disadvantage of the track-laying device makes itself felt. Hence this new combination in which one type vehicle supplements the other.

Usually the creeper trailer type is a two-wheeler with rubber tires. The advantages of this type over the four-wheeler are low weight, ease of loading and cheaper construction. For specially heavy loads, wood wheels with steel bandages are used in place of rubber, but the decid-

ed preference is toward rubber-shod trailers.

Another development is the fitting of wheels to certain creeper tractors and the provision of creeper bands to certain types of ordinary trucks. Some of the new track-laying tractors, designed for special purposes, the nature of which need not be specified, have in addition to their endless bands a front axle with steering mechanism and a rear axle to which power is transmitted. Detachable cast-steel wheels shod



An ordinary Delahaye army truck fitted with creeping bands at rear



Line of heavy guns mounted on special trailers and hauled by tractors

with solid rubber tires are attached to these axles, and when in position they raise the band off the ground. To put the wheels on, the front of the tractor is run onto suitable blocks of wood, thus throwing the nose of the machine upon and giving the clearance necessary to fit the wheels. With the front wheels fitted the machine is backed down off its block and the rear end raised in the same way. Owing to the weight of the wheels necessary to carry a substantial creeper tractor, block and tackle permanently attached to the chassis is provided for each wheel. A vehicle of this nature runs on rubber-tired wheels when hauling loads over ordinary roads. Its speed can be increased at least 50 per cent compared with its speed as a track-layer. On reaching the zone where roads disappear, or on entering the district

where it becomes necessary to go across country, the wheels are unshipped, mounted on brackets specially designed to receive them, and the vehicle becomes a track-laying machine pure and simple.

This problem also has been tackled from the opposite end. Thus instead of fitting emergency wheels to a creeper, emergency creeper bands are attached to an ordinary truck. This attachment has been found useful for normal type 3 to 5-ton trucks which at times are called upon to operate away from all made roads, where nothing but a self-track layer will suffice. This device has been made use of on Delahaye chain-driven trucks; which are very similar mechanically to the American White; they also have been adopted to a certain extent on the four-wheel-drive internal-gear Latil tractor. The creeper attached is designed

specially for the truck on which it is applied, but no changes are required on the truck other than the withdrawal of the wheel.

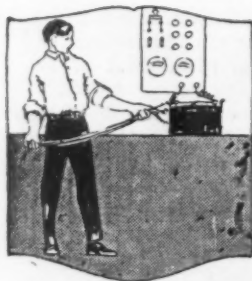
Used on a 3-ton truck the length of the band in contact with the ground is about 36 in. A similar device is used in some cases for the front wheels but is not altogether satisfactory, owing to the enormous drag on the steering gear by reason of the big surface in contact. The best use of this attachment has been found to be for emergency conditions in mountainous country. It happens that from time to time—it may be for a short period only—a truck has to reach some position almost inaccessible for the ordinary type of vehicle having power delivered to its rear wheels. Rather than make use of a creeper, which is generally a tractor only with little load-carrying capacity, it has been found more advantageous to attach the track-laying device when conditions call for them.

FORDSON WINS ALL-ENGLAND

Dearborn, Mich., June 21—According to a telegram received by F. Myers, tractor representative for Henry Ford & Son in Holland county, England, the Fordson tractor serial number F 69 had won the All-England championship for the period ending April 6. This in spite of the fact that the tractor lost five days—the competition for the tractors starting before the Fordson arrived. The tractors worked on four separate farms. During the three weeks and two days it was in commission the tractor plowed, cultivated, etc., 470½ acres and the amount earned was £142, 18s, \$692.37. The paraffin consumption was 2 6/7 gal. per acre. The tractor was worked by two soldiers who have been trained in the county and who previous to this had no experience in the working of tractors. They worked 12 hr. a day, including Sunday. The championship shield received by the men is a fine work of art and bears the inscription "National Food Campaign Champion Tractor of England and Wales." The championship shield will be held for one month.



Army truck with creeping bands having to be hauled out of soft ground by oxen



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the hundredth installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.

A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part C—Dyneto System for Ford Cars—Concluded

IF, with the lamps turned on and the starting switch thrown to the start position, the lamps drop slightly in candlepower and the electrical unit does not turn the engine over, the trouble may be due to a loose connection, roughened or dirty commutator, brushes worn or not well fitted to the surface of the commutator, weak brush springs, or the armature or field windings may be grounded or otherwise defective.

If, with the lamps turned on and the starting switch thrown to the start position, the lamps burn very dimly or not at all, the trouble is probably due to the battery, and a thorough inspection of it should be made to see that the terminals are clean and that there is ample solution in each of the cells to cover the plates.

If the motor starts but turns the engine very slowly, the trouble is likely due to too much resistance in the circuit or a defective or discharged battery. The high resistance may be due to the use of too small wire, loose terminals at the battery, starting switch or electrical unit, poor electrical contact in the starting switch, rough or dirty commutator, worn out brushes, insufficient tension on the brushes to keep them in contact with the commutator. Look for weak or partially discharged battery, which may be due to grounds or short-circuits, unnecessary use of the lights when the engine is not run enough to keep the battery charged, or unnecessary cranking of the engine when it will not pick up, due to poor adjustment of the carbureter or faulty ignition.

North East System for Ford Cars

THE North East system for Fords is a two-wire, 12-volt, or 24-volt, single-unit chain-drive type of equipment, but it is different from the usual form of chain drive inasmuch as two separate chains are used in forming the mechanical connection between the crankshaft of the engine and the shaft of the electrical unit. As the system is no longer in production this section will be devoted to the operation and care of the installation. Wiring diagrams of the system are given in Figs. 557, 558 and 559.

Operation and Care

In starting the engine turn on the ignition switch and set the spark lever and gas throttle to the best running position. Press the starting-switch button the full length and hold it there until the engine runs under its own power and then allow the starting button to return to its normal position. If the engine should fail to start after spinning it 5 to 10 sec., open the starting switch and make a careful examination of the following: See

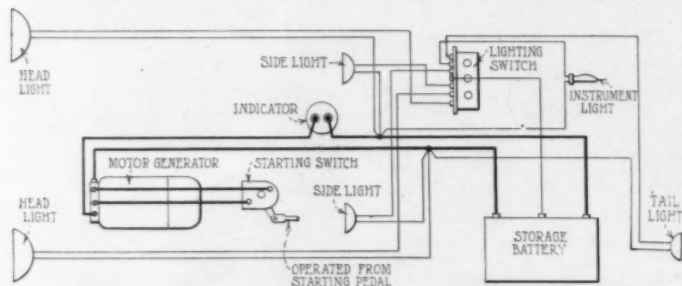


Fig. 557—North East electric starting and lighting system furnished for Fords during the last half of 1913 and first half of 1914

that the spark plugs are clean, the carbureter properly adjusted, the ignition in good order, gasoline at the carbureter.

The chains and sprockets must be kept clean, and after each cleaning apply a little grease to the inside surface of the chains. Be careful that the chain sprockets be kept in good alignment and a moderate tension maintained in each chain.

Keep all parts of the electrical equipments clean and inspect the various connections occasionally to see that they are tight and making good electrical connection. Keep the cover on the rear of the electrical unit in place. It should be removed only when it is necessary to inspect the commutator and brushes. Inspect the commutator occasionally and keep it clean and smooth and the brushes in good contact.

If the electrical unit is removed for any reason, it is advisable to tape the ends of the cables to prevent damage which may result from short-circuits or grounds occurring. The end of the cables should be carefully tagged so that no mistake will be made in reconnecting them when the electrical unit again is installed.

In case it is necessary to run the electrical unit with the battery removed or disconnected, remove the small 10-amp. fuse located over the brushes inside the detachable cover at the rear end of the electrical unit. Be sure to replace this fuse when the battery again is connected in circuit. The blowing of this fuse may be the cause of the generator not charging the storage battery. If such is the case, it should be replaced with another one of the same kind and same current capacity, but under no circumstances use a wire instead of the fuse, as the generator may be seriously damaged without the protection of the fuse.

The bearings of the electrical unit will not require any outside

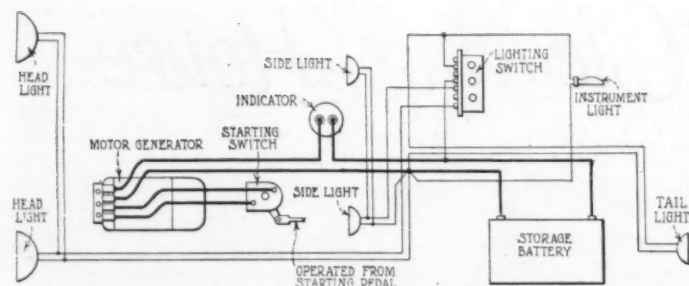


Fig. 558—Flexible-lead type of North East electric starting and lighting system for Fords

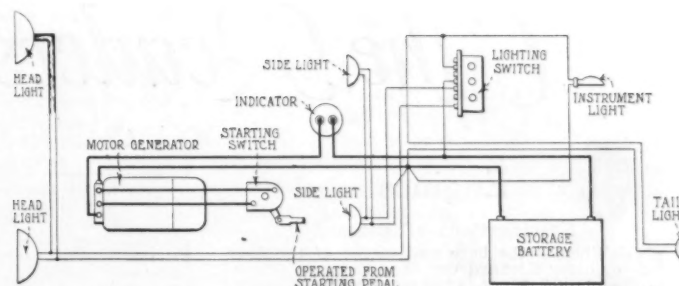


Fig. 559—Binding-post type of North East electric starting and lighting system for Fords

lubrication as they are packed in a special lubricating compound.

The wiring should be inspected to see that it is properly supported and protected at points where there is danger of exposed ends coming together or where there is a possibility of damaging the insulation. Inspect the starting and lighting switches occasionally for loose connections and dirty or burnt contacts.

If the battery becomes discharged under normal use, without

apparent cause, and the fuse under the cover on the rear end of the electrical unit is not blown, the wiring and connections should be examined carefully. If there are no shorts or grounds on the system and the battery continues to lose its charge, there is more than likely something wrong with the battery. If the car stands idle for any great length of time, it is best to run the engine every three or four weeks to liven up the battery, as an idle battery will discharge gradually.

PROBLEMS IN AERONAUTICS

(Concluded from page 27)

landing speed he had been accustomed to in other planes. Once on the field, however, he had acquired so much momentum that the plane went on and on across the field until it struck the fence on the far side.

Fig. 6 compares the landings of the slow-speed and high-speed types of planes, it being seen that the high-speed plane, although it strikes the ground faster and at a steeper angle, comes to a stop more quickly and can land in a smaller space.

A machine of light wing-loading, coming into the field over the trees as shown, must float a long distance at a flat angle before it strikes the ground. If the pilot noses the machine down sharply over the trees, by the time he has lost sufficient altitude to flatten out, he finds himself making a high-speed landing, so that the fact that his machine can land at slow speed has done him no good. After he strikes the ground, as just explained, he rolls a tremendous distance, and is in great danger of breaking the machine, although with small danger to himself on account of the comparatively slow speed.

Safe Landing

The problem then is not entirely one of landing speed. No matter what speed the plane lands at, within reason, if the wheels strike no obstruction the landing is a safe one. If, however, at high speed they strike a hole, or a ditch, or a rut, there is a tendency for the machine to nose over, or even turn a somersault, to the great danger of its occupant. This danger is, of course, less at a lower speed. In other words, in an emergency landing with a high-speed landing machine, there is really less danger of running into objects bordering the field. There is danger, however, of nosing over, if the field is bumpy.

With a machine landing at high speed one can see that having the weight close to the ground would be a considerable advantage, a point that has been discussed somewhat in connection with mechanical arrangements. This indicates a requirement in engine design that has been lost sight of during the early development period when engineers have been learning the fundamentals of aircraft design. This requirement is that the center of thrust due to the engine should be high, or stating it in another way, that the center of weight of the engine should be low, and coincide as nearly as possible with the center of thrust of the propeller, which is, of course, at the engine shaft.

If the center of gravity on an airplane be

low, then the striking angle from the point of contact of the wheels to the center of gravity of the plane, Fig. 7, will be considerable. If this angle is small there is less danger of nosing over. If it is nearly 90 deg. then there will be a great danger of a somersault, hindered only by the area of the tail surfaces. A requirement for safe landing, therefore, is a low center of gravity, and large area and leverage of tail surface.

With the floating type of slow landing machines there is just as much risk of accident with the machine but less danger to the occupant on account of the slower speed.

There is real opportunity for study and research to devise such mechanical arrangements—different from those now in use—as will enable higher speed landings to be made, and with quick stops.

This might be accomplished with a brake on the floating type of machine. An air brake will not do, as at the slower speeds it would have to present, presumably, too great an area to be effective. A ground brake will not entirely do, because at the time the machine first touches the ground the pressure on the wheels and skid is so small as to be almost ineffective. To apply brakes to the front wheels would be like striking a bump, and would probably mean a spill.

I am not stating how this problem of landing is to be solved. I am merely mentioning it as one of the present-day problems of aeronautics that we can well consider as of first importance.

In studying landing remember that if we can add 10 m.p.h. to our landing speed, we can add 20 miles or more to our flying speed. The ideal machine, of course, will be one of sufficient area to make a successful "pancake" landing, but machines with wing loading light enough to accomplish this feat are, with our present knowledge of structure, not within reason.

STANDARD WAGES ADVOCATED

Washington, June 22—Standardization of wages to be paid to labor by Government departments and contractors engaged in war work is advocated in a resolution by the War Labor Policies Board of which Felix Frankfurter is chairman. The resolution states that the competitive bidding by employers for labor has created an unstable wage situation both for skilled and unskilled labor and has resulted in restlessness and wasteful movement of labor from one industry to another.

WAR HITS WILMINGTON ROW

Wilmington, Del., June 24—Because of the tremendous demand on railroad facilities entering Wilmington, due to munition and shipbuilding establishments and other war enterprises which abound here, the railroad authorities have established a hard and fast freight embargo against passenger cars. They are halted at the nearest outside delivery point, where they are unloaded and run into the city under their own power.

The labor problem has become so acute in Wilmington that some of the motor establishments are confining their repairs and care of cars to the ones they especially represent. Labor and transportation are now the two big problems the local men have to deal with. While the latter has been largely overcome through the driveway plan, the matter of help appears to be growing more serious.

There are two reasons for this, three, one might say, for one is that there are more motor cars used here than ever before. The two principal reasons, however, are the inroads made on the man power of the country by the war and the temptation in the matter of wages held out by other industries.

SIX NEW M. A. M. A. MEMBERS

New York, June 22—Six new members were elected by the Motor & Accessory Manufacturers' Association at the meeting of its executive committee June 21, these bringing the total membership to 587. The members elected are:

Buffalo Pressed Steel Co., Buffalo, N. Y., maker of motor car silencers and stampings.

Staybestos Mfg. Co., Philadelphia, maker of brake linings for motor cars and industrial machinery.

Hartford Auto Parts Co., Hartford, Conn., maker of universal joints and cone clutches for motor cars.

Automobile Screw Products Co., Cleveland, Ohio, maker of motor car screws.

Crucible Steel Co. of America, Pittsburgh, Pa., maker of crucible and open hearth steel.

Armstrong Cork Co., Lancaster, Pa., maker of linoleum and cork specialties.

The Readers' Clearing House

Conducted by B. M. Ikert

Engines

Specifications of Richard

Q.—What is the bore and stroke of the four-cylinder Richard car that is manufactured in Cleveland? What is the wheelbase of the car? Publish a picture of this car.—D. M. Woolrey, La Harpe, Ill.

This engine has a bore and stroke of 4 and 8½ in. respectively. It has a wheelbase of 128 in. MOTOR AGE has no picture of this car.

Removing Super-Six Pistons

Kansas City, Mo., Editor MOTOR AGE—In one of your issues someone asked how to remove the pistons from a Hudson Super-Six. Experience has taught that one piston or six pistons can be removed from the Super-Six crankcase in the shortest time by not removing the cylinder block. Our method is as follows: Take down crankcase oil pan. Remove crankshaft weights Nos. 2 and 7. Remove studs which hold these weights. Disconnect connecting-rod crank-end bearings and pull connecting rods and pistons Nos. 1 and 6 down on left-hand side of crankshaft. Pull Nos. 2 and 5 down on right-hand, or camshaft, side of crankshaft. Pull Nos. 3 and 4 down on either right or left side of crankshaft. When assembling, be sure that the crankshaft studs are put in with white lead and are drawn up tight.—Noble D. Gilkeson.

Timing Stearns-Knight

Q.—Advise me how to check up and time the Stearns-Knight eight-cylinder engine, series 31.—Bruce B. Lybarger, Osage, Iowa.

To time the valves on the Stearns-Knight eight cylinder proceed as follows:

Turn the engine over by hand until the mark 1-4-R.H is in line with the mark on DC

the crankcase. Turn the eccentric shaft and sprocket until the arrow is in line with the guide mark on the front end of the

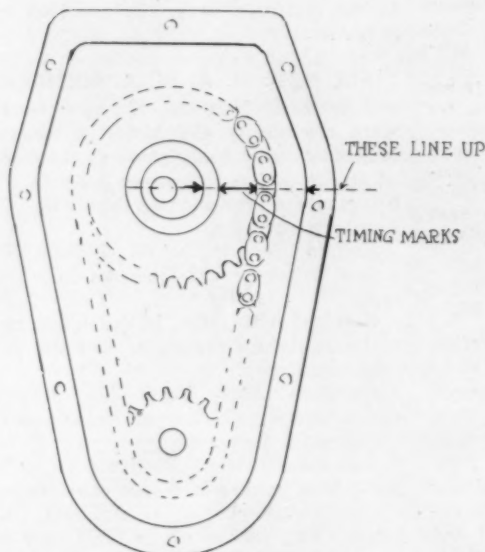


Fig. 1—Front view of Knight engine, showing marks on eccentric shaft, sprocket and case for timing. The other view shows a thin piece of paper inserted in the port to determine when the exhaust is closed

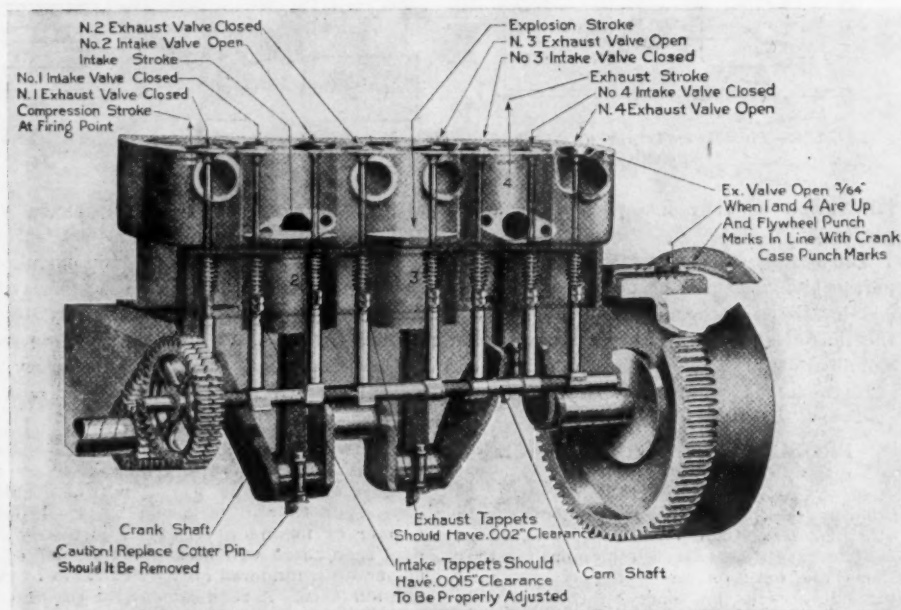


Fig. 2—Pullman engine with explanation of timing and other information

chain housing. This is shown in Fig. 1. Then slip on the driving chain. This is provided you have had the engine down.

If you want to check up on the timing, put an electric lamp in the No. 1 right-hand port of No. 1 right-hand cylinder and stop cranking the instant the light disappears through the port. When this occurs the mark 1-4-R.H should be in line with

DC

the crankcase mark. Some repairmen check up on the timing as follows:

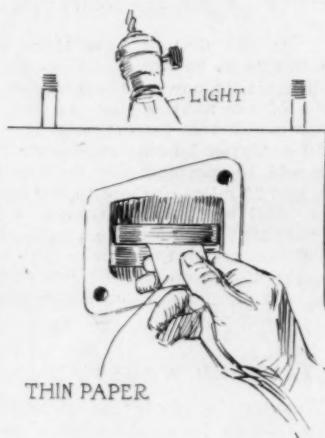
When the preceding mark and crankcase mark are in line it signifies that the exhaust port of No. 1 right-hand cylinder is

closed, and to determine this a strip of paper is placed through the port and the engine slowly turned over. The instant this paper is pinched the exhaust valve closes and the marks should be exactly in line. A complete cycle of operation of one cylinder of the Knight engine is shown in Fig. 3. In the first position the inlet valve is opening and the second shows it open. In the next position the inlet closes and the fourth position is that when the piston is at the top of the compression stroke. The exhaust valve is shown opening in the fifth position and the next shows the exhaust open. The last position is when the exhaust closes and it is at this point that the marks should be in line.

Timing Pullman Engine

Q.—Explain the proper method to time the valves on a 1915 Pullman, Jr. The engine is a G. B. & S., 3½ by 4¼, camshaft chain driven, Apeldo distributor mounted on top of starter. What is the proper space between valve stems and tappets on this engine? Do the markings on the flywheel of any engine, I-O or E-O, mean that the valve starts to open or that tappet starts to raise? Is this the correct way of timing the valves on an engine? No. 1—piston on bottom center, down, camshaft set so exhaust valve is wide open on No. 1 cylinder?—F. F. Casterline, Aransas Pass, Tex.

To time the valves on the Pullman get No. 1 and 4 pistons on dead top center. The marks 1 and 4 on the flywheel should be brought to the top, and the pistons will be in the correct position. Keep the engine in this position and revolve the camshaft gear until No. 7 piston, counted from the gear end, just raises the tappet. At this point a medium should be maintained, that is, No. 7 tappet lifts and No. 8 begins to seat. It will be noted that the cam plate has two prick punch marks at the center of the outer opening where the cam gear revolves and the cam gear has two corresponding marks. These should be held stationary in respect to one another while the chain is being assembled. The magneto



gearbox then can be assembled and the chain tightened. To make sure the timing is correct apply a wrench to the crankshaft ratchet nut and move the crankshaft a slight distance, noting the action of the cams No. 7 and 8 mentioned before. Hence, if No. 1 and 4 on the flywheel remain in the normal position, the cam plate is timed correctly.

The exhaust valves should have 0.002 in. clearance and the intakes 0.0015 in.

The marks I-O means that the inlet valve starts to open, and E-O means the exhaust valve starts opening. The tappets start to raise at the same time as they open the valves and naturally the latter cannot start to open until the tappets come up.

In the average four-cylinder engine the exhaust valve should start to open about 45 deg. before bottom center and close about 5 or 6 deg. after top center. This would bring the point of maximum opening about 70 deg. past bottom center, with the piston coming up. The intake valve on an average engine opens about 11 or 12 deg. past top center and closes something like 37 deg. after bottom center. Of course, there are variation to this rule; some intakes open immediately the exhaust closes, etc.

Scraping Engine Bearings

Q.—How are motor car engine bearings scraped and what tools are best for this work? How are oil grooves cut in engine bearings and what tools are used? How tight should wristpin bearings be? Which is the best way to fit wristpin bearings?—E. J. Pearson, Jarbridge, Nev.

Having dismantled the engine the bushing should be opened in both the shaft and the two halves of the bushing covered inside with chalk or, better still, painted with a thin coat of Prussian blue, obtained by dissolving the material in water. Let this dry and clamp the two halves together again. Revolve the shaft a few times and again take the bushing apart, when you will see that the blue paint has been rubbed off those parts of the inner surface of the bush that are high or rough. This gives you something to work on and you are ready to clamp the bushing in a vice and begin the actual job of scraping.

In Fig. 4, 1, is shown the ordinary form

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has segregated inquiries into classes of allied nature. Questions pertaining to engines will be answered under that head, and so on.

ENGINES

D. M. Woolrey.....La Harpe, Ill.
Noble D. Gilkeson.....Kansas City, Mo.
Bruce B. Lybarger.....Osage, Iowa
F. F. Casterline.....Arkansas Pass, Tex.
E. J. Pearson.....Jarbridge, Nev.

REBUILDING

Robert Cusick.....Kansas City, Mo.
R. E. Martin.....St. Mary's, Ontario
Gazeck Bros. Motor Car Co.....
.....Menasha, Wis.
Charles Hiss.....Stockton, Utah

MISCELLANEOUS

A. Miller.....Polo, Ill.
Reader.....Denver, Col.
Gregory Flynn.....New York
E. J. Pearson.....Jarbridge, Nev.
E. E. E.....Oliver, Ill.
Reader.....Rice, Kan.
G. H. Ribbing.....Hiteman, Iowa
Subscriber.....Camp Sherman, Ohio
F. F. Casterline.....Arkansas Pass, Tex.

CARBURETION

E. E. E.....Oliver, Ill.
Burton Litson.....Paradise, Mont.

No communication without the writer's name and address will be answered in these columns.

of split bushing used in motor car engines and Fig. 4, 2, shows the method of doing the work. The scraper is a special tool having a work end of some such form as shown in Fig. 4, 3. These can be purchased at any motor car supply house. Also a tool like this can be made without a great deal of trouble from an old file which originally had a half round form. A grinding wheel must be brought into service to make it, however.

Grasp the scraper as shown and delicately scrape down the spots from which the paint has been removed. This done, again place the half on the shaft and clamp to

gether after having again completely coated the surface with blue paint. Rotating the shaft will reveal other bright spots where the paint has come off, and these must be scraped down as before. This operation is repeated until finally the blue rubs off smoothly all over the bushing, indicating that the surface is smooth. It takes probably an hour or more for a skilled man to scrape one bearing, so the beginner should not be discouraged if it takes him somewhat longer. Of course, it is not necessary to have a very perfect surface to work well, provided the bearing fits well to its shaft but the better the surface, the better resulting operation of the engine.

Shims are provided between the caps and supports of most engine bearings, so after scraping it is essential to fit each bearing to its position correctly. The shims are applied not only to the main bearings but to the connecting rods as well. They are of varying thickness and in Fig. 4, 4, is shown a typical connecting rod big end with the shims in their relative position. Connecting rod bearings can be tested with Prussian blue in the same manner as with main bearings, and the procedure in scraping is exactly the same. The thing to bear in mind is that the work must not be hurried, because if not carefully done the bearings may be drawn up too tight, causing the babbitt to cut away rapidly, making it necessary to put in new ones very soon.

Oil grooves in bearings can be cut with a three-cornered tool, and the shapes generally used are shown in Fig. 11. One method is to make the grooves in the shape of an X and the other an H. Experience seems to show that the H form is to be preferred, because in the other the bearing surfaces marked A often fail to get proper oiling. Wrist pin bearings, like other bearings, must be tight enough so there is no play and yet not so tight that the oil cannot get to them. Most wrist pin bearings are constructed with the pin fastened to the connecting rod, so the pin itself works in bushings forced into the piston bosses. Replacement of these bushings is the proper remedy for worn piston pin bearings. Some-

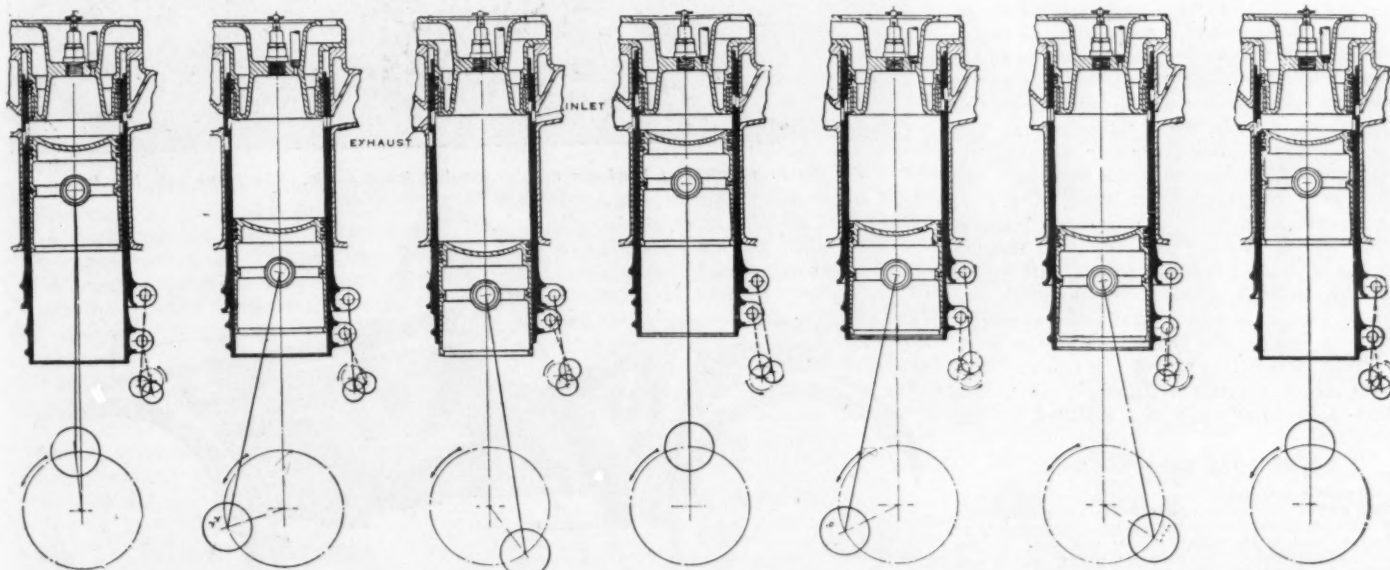


Fig. 3—Cycle of operation of the Knight sleeve-valve engine. From the last position of piston and sleeves it will be seen that the exhaust valve closes on dead center

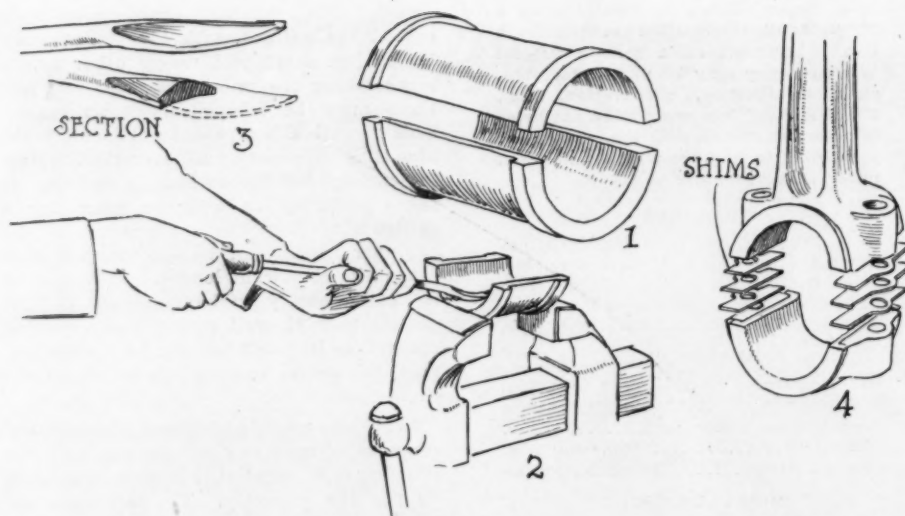


Fig. 4—1, Ordinary form of bushing; 2, Scraping the bearing; 3, Form of scraper; 4, Connecting rod bearing shims

times the pin also has to be replaced. When properly fitted there should be no lateral play of the pin in the bushes, but the pin should slide freely in the bushes, being prevented from coming out by the connecting rod, which strikes the bosses.

Rebuilding

Ford for Dirt Track Work

Kansas City, Mo., Editor MOTOR AGE—Thinking that your readers might be interested in my rebuilt Ford, I am inclosing a picture of the car, showing especially the front axle and spring arrangement. This car has been cut down and shortened for work on $\frac{1}{2}$ -mile tracks. It has been properly balanced and I find I have all the reserve speed I need to compete on tracks. Some of the tracks, however, do not allow of all the speed, so I am forced to go on a partially open throttle.—Robert Cusick.

Cutting Roadster Into Speedster

Q.—Would like suggestions and illustration for making a speedster out of a Cutting roadster which has a long wheelbase. Explain how to change from side to center control.—R. E. Martin, St. Mary's, Ontario.

In Fig. 6 is shown a suggestion for converting this car into a speedster. It is difficult to give definite information as to the best way of changing from side to center control. Unless one has actually done this job there is little use in telling a man how to proceed, because there are obstacles encountered that require much figuring. The best way to go about it is to let a good mechanic look over the present installation and see what can be done in making a change. It generally means cutting off the levers, rods, making new brackets, etc. Each case demands a particular construction and unless the owner can do the work himself it is better to get a mechanic. The expense of making a drastic change like this is in many cases not justified by the results.

Rebuilding Regal for Speed

Q.—We are rebuilding an underslung Regal and would like to see sketch showing this with a new radiator such as is used on the Fiat and a new body which comes out well to the rear of the car. The exhaust pipes, which are three in number, are to come on the outside, leading into one large long muffler. No fenders will be used. Ventilating vents will be on top of the hood, as on the Fiat.

We wish to use a round windshield which is fastened onto the steering column. Where can this be purchased?

2—Is it advisable to drill the pistons on this car and also the connecting rods, providing same are balanced in weight after drilling?—Gazecki Bros. Motor Car Co., Menasha, Wis.

1—A suggestion for rebuilding an underslung model Regal into a speedster is shown in Fig. 8. The only concern we know of making a circular windshield to attach to the steering column is the Chicago Coach & Carriage Co., 1223 Michigan avenue, Chicago.

2—We do not think you will gain very much by drilling the pistons and connect-

ing rods of this engine. It is true that your reciprocating parts would be reduced in weight, but to realize the best speed and power derived from the drilling you also should enlarge the valve ports and valves, fit a larger carburetor, etc. This probably would give you more power, but the engine would lack one important asset, that is, it would vibrate considerably, unless you had a counterbalanced crankshaft. By fitting such a shaft or attaching weights to it the engine can be accelerated and kept on a wide open throttle without vibration. It is one of the important steps in rebuilding an engine for high speeds.

1913 Studebaker Speedster

Q.—Publish an illustration of a 1913 five-passenger Studebaker converted into a speedster.—Charles Hiss, Stockton, Utah.

This is shown in Fig. 9. The dotted lines are those of the old body. Note that the gasoline and oil are carried under the rear deck. This is one of the best ways to build these bodies, as the construction is fairly simple and allows of easy filling of the tanks.

The Electric System

Battery Fails to Hold Charge

Q.—I have a 1916 Scripps-Booth roadster with a Bijur ignition starter and switch, which runs the battery down about every two weeks. The battery is a Willard 12-volt, and nobody can find a short anywhere. I have been told it is impossible to keep battery charged with the Bijur system. Is this correct? How can I connect dry cells to start car when battery runs down, and how many does it take?—A. Miller, Polo, Ill.

You have been misinformed when told that the battery cannot be kept charged



Fig. 5—Front view of Ford car rebuilt for dirt track work. The front axle has been cranked to lower the body

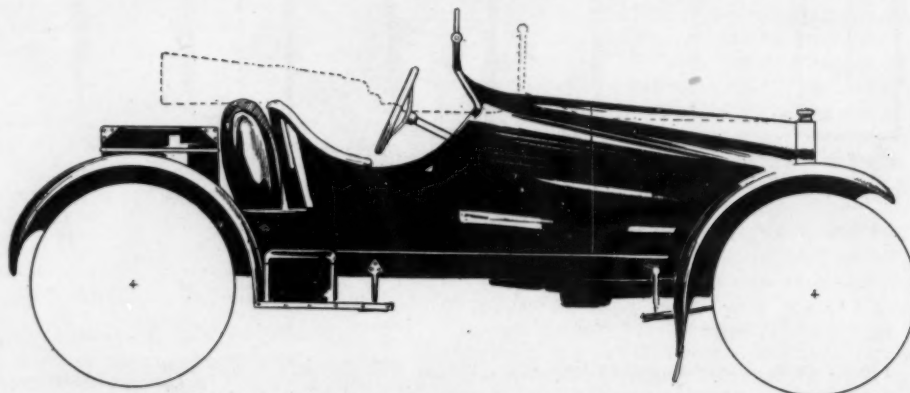


Fig. 6—Cutting roadster converted into speedster with altered lines

with the Bijur systems, as this is giving good service on other cars. Failure of the generator to charge the battery may be due to several reasons. You do not say anything about the brushes in the generator or the condition of the commutator. Also, it may be that your battery has been neglected at times and allowed to remain in an uncharged condition too long. If the generator, indicator, etc., are known to be in good condition and yet the battery discharges rapidly, it is logical to look for the trouble in the battery itself. If a battery is too old much of the active material may have dropped from the grids, thus causing an internal short-circuit. The remedy would be to send the battery to a Willard service station and have new plates installed.

Many owners go for a long time without paying any attention to the brushes in the generator. These wear, and in addition the commutator gets rough and must be smoothed down. The carbon particles from the brushes form a sort of path around the commutator and thus make a short-circuit. High mica, that is, the insulation between the commutator laminations projecting above the copper segments on the commutator, also makes proper charging impossible. The armature must be removed in this case and the mica undercut. The copper segments must be above the mica, so the brushes will seat properly and collect the current.

Sometimes a car is used very little during the daytime but runs considerably at night, in which case the lights must be used. This naturally drains the battery, and if the starter is used much the result is that the generator is not given a chance to charge sufficiently. This is, however, more the case in cold weather, when the efficiency of a battery drops.

In Fig. 10 is shown the method of connecting batteries to the system when the battery goes dead. You will need eight cells and they should be connected in series.

Condenser Burns Out

Q.—I have a Bosch D. U. 6 magneto, which gives trouble by the condenser burning out. When it goes bad the breaker points fuse very much. Wiring and switch seem all right. The repairman returned this magneto as all right, after putting in a new condenser and breaker points, but the last one only ran eighteen days and went down. A magneto expert told me to have a mica condenser built and installed, stating that it would end my troubles. Why does not Bosch use mica condensers?—Reader, Denver, Col.

Each manufacturer undoubtedly knows what the best material is to use in making the condensers for his particular magneto. It is possible to use heavier insulators in condensers, but it must be borne in mind that the paraffin insulators, that is, those composed of paper immersed in paraffin, purposely are made thin to bring the surfaces of the plates or the tinfoil closer together. This increases the absorption properties of the condenser, which would be decreased materially if heavier insulators were used to eliminate possibility of a short-circuit.

Miscellaneous

Bebe Peugeot Illustration

New York, Editor MOTOR AGE—I noticed in the May 30 issue that one of your readers

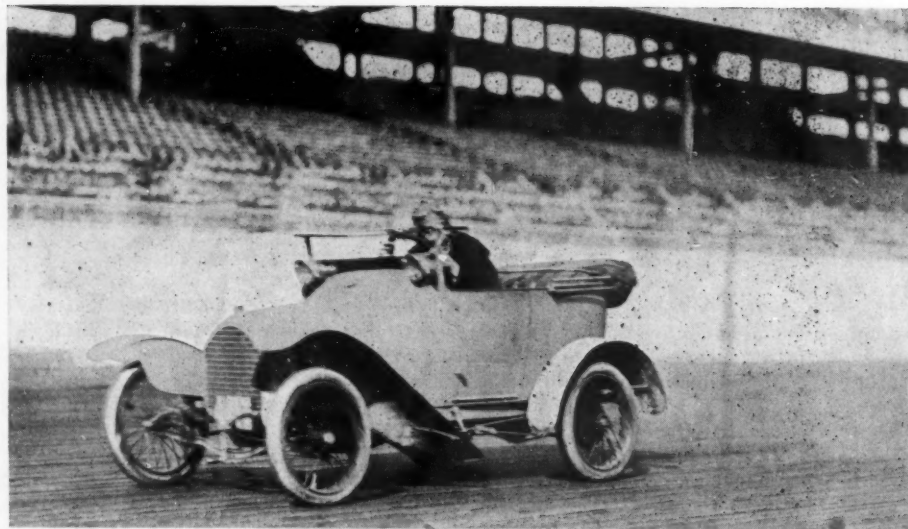


Fig. 7—Bebe Peugeot being driven 40 m.p.h. on the Sheepshead Bay track

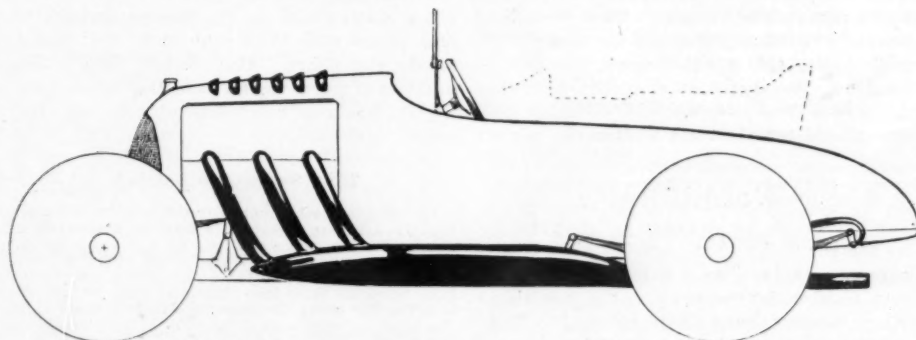


Fig. 8—Suggestion for reconstructing underslung Regal into snappy speedster using high radiator

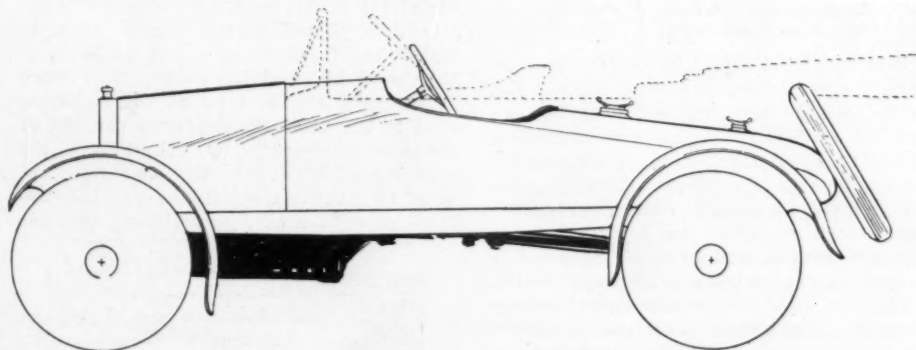


Fig. 9—How a Studebaker might be cut down into a speedster

asked for a picture of the Bebe Peugeot, consequently I am sending a picture of the Bebe I formerly owned. The car is shown traveling about 40 m.p.h. on the Sheepshead Bay track. This car, while similar to the one described, had a three-speed gearset and was considerably faster than the one with the two-speed gearset. I bought it in 1915 and it had a racing body with large exhaust pipe on the outside, similar to the large racing Peugeots. This car is at present owned by Louis Chevrolet, who says it is still running in great shape.—Gregory Flynn.

Soldering Aluminum

Q.—How is aluminum soldering done, with soldering salts or acids? Also is aluminum solder used?—E. J. Pearson, Jarbridge, Nev..

Various compounds for carrying out this soldering have appeared on the market from time to time, but much of the opera-

tion depends upon the skill of the worker. The greatest difficulty in soldering aluminum is that the heat is absorbed so rapidly that it cools the soldering iron. Another difficulty is that aluminum oxidizes instantly upon exposure to the air, this thin film preventing a perfect union of the two surfaces. One way to overcome this is to have the parts well heated and the melted solder kept hot while the iron stands on it. Then the surface can be scraped beneath the melted solder with the point of the iron. In this way it is possible to tin the metal.

Sometimes zinc is used but usually this does not form a strong joint. Another substance that can be used is tin, which is stronger than zinc but much more difficult to manipulate. If a small portion of phosphor-tin is added to the pure tin, it works easier. In fact, the combination is the basis of some of the aluminum solder sold.

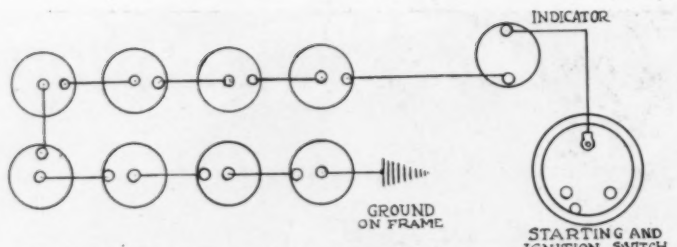


Fig. 10—Connecting dry cells in ignition system when battery goes dead

The parts to be joined should be well cleaned by scraping or by dipping into a solution of nitric acid in hot water. The solution is made by mixing the acid with three times its bulk of hot water, to which has been added a little commercial hydrofluoric acid. The solution will have a chemical action on the metal, which should be dried in hot sawdust after the acid bath. A formula which can be used for uniting aluminum parts can be made out of the following: Cadmium, 10 parts; zinc, 10 parts; tin, 10 parts; lead, 1 part. This formula, however, should only be used by those who are skilled in this kind of work.

Engine Bolts on Chevrolet

Q.—Should not the bolts holding the engine to the frame in a Chevrolet be tight? What is the purpose of the small hole in the top of the starter? Is this for oil, or has a bolt been lost?—E. E. E., Oliver, Ill.

The bolts must be absolutely tight; otherwise the car will vibrate considerably when the engine is running. A loose engine on frame is also detrimental to the working parts and breakage is likely to result. The small hole you mention is an oil hole.

Water Boils Occasionally

Q.—When running my car the water sometimes boils, what is the cause of this?—E. E. E., Oliver, Ill.

Occasional boiling of the water does no harm, but if it happens right along you had better look for the trouble. First, be sure you are giving the engine proper lubrication. Lack of lubrication is responsible for many cases of overheating. Some owners never drain the oil from their crankcase, which oil, after many weeks of use becomes diluted, and even if fresh oil is poured in, it goes but a little ways toward oiling the cylinder walls and bearings properly. The correct way is to drain out the old oil and clean out the crankcase with kerosene, allowing the engine to run slowly for a few minutes to give the kerosene a chance to wash off the walls and bearings. Then this is drained and fresh oil put in, after which the engine should be run slowly for a short time to give the new oil a chance to get between the surfaces.

Too rich a mixture, driving on a retarded spark too long, lack of water in the cooling system, bent fan blades, slipping fan belt, etc., all cause overheating. No owner, however, should worry if his cooling water boils occasionally. In summer it often helps cooling to remove the hot air pipe on the carburetor. This should only be done in real hot weather.

Axle for Trailer

Q.—I would like to make a trailer and connect same to my car. I have a Maxwell rear axle with full-elliptic springs. Could the differential gear be removed? It is a semi-floating axle.—Reader, Rice, Kan.

You could use this axle for a trailer by

leaving the differential as it is and simply removing the keys that hold the wheels to the axle shafts. This, however, would not be as good as locking the wheels to the axles with the keys and letting the shafts revolve on the bearings. You could take out the differential, including the case, spider, gears, etc., and slip a tube over the ends of the axle shafts to act as a distance piece. This would keep the axles from working toward the center, although the wheel hubs would prevent this also. Another way would be to remove the spider and gears and then put back the spider minus the gears. This would reduce the number of parts in the axle and allow each wheel to revolve independently of the other.

How Gears Are Shifted

Q.—Explain why gears cannot be shifted immediately after the clutch is out on motor cars. When are the gears running at the same speed, so that they can be shifted? Is there a time after throwing out clutch and putting gear lever into neutral that the clutch should be let in, to bring the gears to proper speed, before putting the gear lever into next speed? How does shifting gears differ on a truck than on a motor car?—Subscriber, Camp Sherman, Ohio.

The gears cannot be shifted immediately the clutch is thrown out because it has not slowed down sufficiently in most cases to permit the teeth of the gears to mesh, as they must be revolving at the same speed before they can be meshed. It is impossible to tell when the gears are running at the same speed except by feel. That is, the experienced man generally can tell just when to make the shift. As one becomes familiar with a car, gearshifting becomes

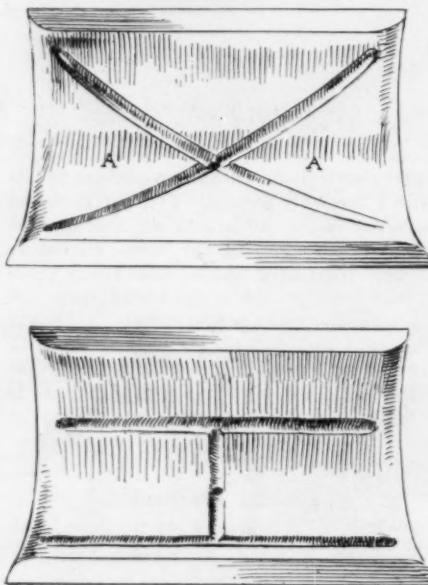


Fig. 11—Two methods of cutting oil grooves in bearings

an easy matter. In shifting from a lower to a higher gear the driver must wait momentarily before the shift is made, as the clutch shaft must be given a chance to slow down, so it will be revolving at the same rate as the countershaft carrying the gears. In shifting from a higher to a lower gear, as on a hill, for instance, it is not necessary to wait, but in addition the engine must be slightly speeded up, as it will revolve faster with the lower gear. Gearshifting on a truck is the same as on a passenger car.

Proper Gasoline Level

Q.—Give proper gasoline level on a 1-in. type K. Stromberg carburetor.—F. F. Casterline, Aransas Pass, Tex.

The proper float level is made and locked at the factory. In general the gasoline level in the different makes of carburetors varies from $\frac{1}{8}$ to $\frac{1}{2}$ in. below the top of the spray nozzle.

Carburetion

Wants New Carburetor

Q.—I have a Woods Mobilette equipped with a carburetor that is not very satisfactory, I think. Would the model F Sunderman carburetor be satisfactory for this car? The engine is four-cylinder, $2\frac{1}{2}$ by 4.—Burton Litson, Paradise, Mont.

The trouble may not be with the carburetor but with the adjustment of it. If you can not get an adjustment send it to the makers and let them look it over. However, if you wish to try another make, any of the standard makes ought to give satisfaction. The Sunderman carburetor should meet all your requirements, as it is of very simple construction and easy to adjust.

Adjusting Chevrolet Carburetor

Q.—How is the Zenith carburetor on a 490 model Chevrolet adjusted, so as to give a leaner mixture? How many miles per gallon should this car go?—E. E. E., Oliver, Ill.

The Zenith carburetor on this car is carefully tested and adjusted to the car when it leaves the factory and needs no adjustment thereafter. The instrument is designed to give satisfactory results for all changes in gravity and atmospheric conditions when the engine is heated to the proper working temperature. Very often the owner makes adjustments on a carburetor when in reality something else is the cause for uneven running or the engine has not been sufficiently warmed up. The carburetor is one of the last things to suspect. The only moving parts in your carburetor are the float mechanism, and about the only thing you have to do to it during the life of the car is occasionally to clean the strainer of dirt and other deposits. To do this unscrew the hexagonal nut on the bottom of the float chamber, clean out and replace, using soap on the threads to make a tight joint.

With the engine properly lubricated, ignition correct and all other items, such as valves, cooling, brakes, etc., in good order you should get about 24 m.p.g. This figure naturally varies, depending on the way the car is driven, whether it is used in the city, where traffic demands frequent stops, or in the country. Naturally you will get better results in long country runs, especially if the roads and weather are good.

The Motor Car Repair Shop

Minor Speedometer Adjustments

ONCE in a while something goes wrong with the speedometer installation, which, unless the trouble be in the instrument itself, usually can be fixed by the owner. It would be folly, for instance, to attempt to take the head apart, if it did not register, and attempt to sift the fault, for the modern speedometer is about as complicated as a watch and only a speedometer man should tackle the job. There are, however, other small parts that go wrong occasionally, and these are not beyond the average man to remedy. For instance, the knurled sleeve coupling at the bottom of the speedometer where the shaft is held in place sometimes shakes loose and allows the shaft end to drop away from the instrument. This is shown by failure of the instrument to register the miles per hour, season or trip mileage. The remedy is simple:

The coupling should be backed off from the head and the flat end of the shaft pushed into the corresponding slot in the instrument. Then when the coupling is tightened the instrument will again register. Be careful to see that the shaft does not bind in the flexible housing that incases it. This may happen if the housing has any sharp bends in it. Some owners make the mistake of tying up their shafts in the manner shown in the illustration. This causes the shaft to kink and consequently it may bind or break. So far as possible the shaft should make one continuous bend from the front wheel to the head, and if it must be supported a leather holder should be made, as shown. The leather sleeve should be as long as possible, so that the tendency will be to do away with kinking.

Speedometer Gearing

Another important thing to watch is that the speedometer gearing is changed when a change in tire size is made. Readings will be incorrect if the same size gears are used, for instance, with 35 by 4½ tires, when the car has been using 34 by 4 in. The first mentioned size would require a sprocket with seventy teeth, while the 34 by 4 takes one with sixty-eight teeth. This seems but a trifling difference, but it makes a great deal of difference in a season's travel.

Now and then a speedometer is found on which the needle, or dial, fluctuates. This may be due to a loose shaft, as mentioned above, or the shaft may be broken, so the ends of the broken link come into engagement occasionally. A broken shaft of this type can be repaired easily by the owner. Simply draw out the two parts of the shaft and connect with a new link; a few of these should be carried in the tool box at all times. Run a thin wire through the housing and draw the shaft through with this, hooking it on the end of the wire. To detect a fault in the instrument, if it does not register, disconnect the sleeve coupling

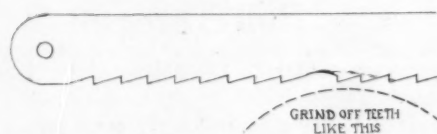
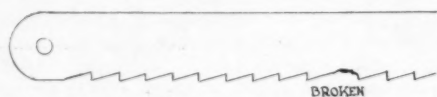
and have someone rotate the front wheel. If the shaft end is seen to rotate continuously, it shows the drive all right and the trouble must be in the head. If so, send it back to the maker or service station. Wear in the fiber pinion at the bottom of the shaft is best remedied by putting in a new one, as they are cheap.

Curing Trouble from Overheating

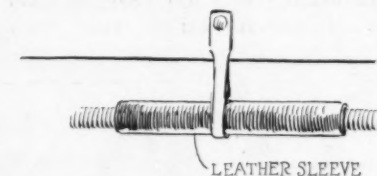
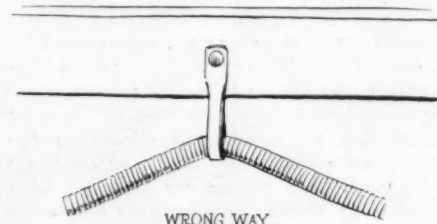
MOTOR AGE receives many inquiries from owners who seem to be troubled with chronic cases of engine overheating. In spite of what is done in the way of car-

bureter adjustment, spark position, water connections, lubrication, fan, etc., the trouble seems, on some cars, impossible to remedy. The trouble in some such cases may be attributed to the casting of the block itself. Occasionally a block that should have been rejected at the foundry is passed through and the owner who is unfortunate enough to get it gets trouble also. Ordinarily overheating or boiling of the cooling water will do no harm, but if the water boils easily and continues to do so on long runs, it should be remedied.

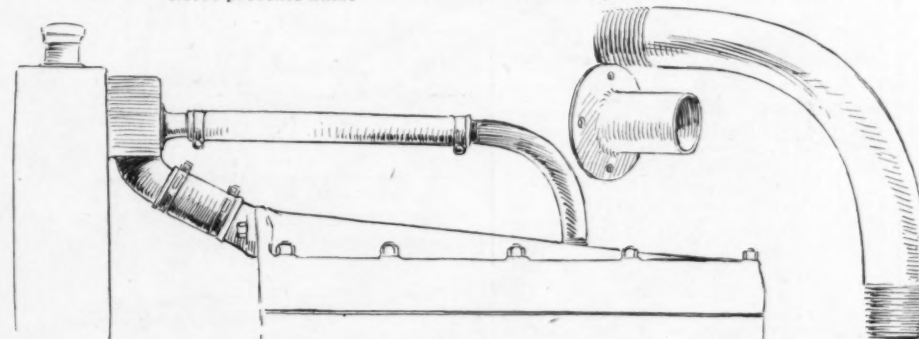
One way in which this condition was successfully overcome in the case of a Ford engine is shown on this page. The head was taken off the block and a 1-in. hole drilled and tapped for a 1-in. pipe. This hole was drilled in the center of the head. The radiator was removed and a hole cut in the extension tank at the top so the brass flanged sleeve could be soldered to it. The flange was drilled for bolts, the nuts of which were soldered on the inside of the tank. Thus the flange was bolted in place and then soldered. The outside diameter of this tube should be the same as the outside diameter of the pipe. The pipe for the center of the head was one with a big curve in it, such as used for electrical conduit work. The job was finished by clamping the hose in place. This outfit allowed much of the water in the rear of the block to get to the radiator without having to pass entirely through the block. It could be improved further by putting in a valve, so the by-passed water could be shut off in winter, if desired.



How a broken portion of a hacksaw blade can be ground to cut smoothly



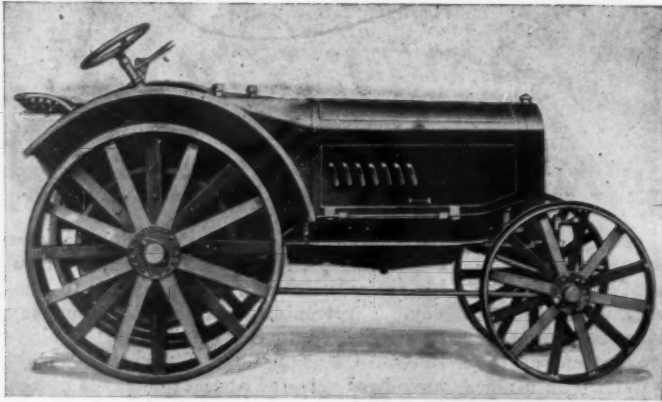
Right and wrong method of supporting speedometer shaft. A leather boot or sleeve prevents kinks



Arrangements used on Ford car to cure trouble from overheating. In cold weather a valve could be installed to force all the water through the original outlet

Grinding Saw Blade

Lockney, Texas, Editor MOTOR AGE—Often a tooth is broken out of an almost new hacksaw blade. Other teeth soon will follow suit, due to the double strain thrown on same, especially if pipe or anything of similar thickness is sawed. By grinding the teeth as shown the blade can be used until worn out. The points of four or five teeth are ground, so that the strain is not on the first tooth after passing the broken ones.—E. Byars.



Emerson-Brantingham 12-20-hp. tractor, with, at right, views of piston and connecting rod

Emerson-Brantingham Brings Out New Tractor Model

THE new tractor model of the Emerson-Brantingham Co., Minneapolis, Minn., is of the motor car type, with four-cylinder engine arranged longitudinally in front under a bonnet, a cone clutch, sliding change-speed gear, bevel gear transmission to a jackshaft and transmission by pinion and internal gear from the jackshaft to the rear wheels. It has a 12-20 S. A. E. rating. Starting is by gasoline and operating by kerosene. The machine is rated to draw three or four 14-in. plows. Its net weight is 4355 lb.

The engine is a typical tractor type and uses a Bennett $1\frac{1}{2}$ -in. kerosene carbureter. A fuel tank with two compartments holds 20 gal. of kerosene and 4 gal. of gasoline. Water injection is used with the kerosene. The air is drawn through a Bennett centrifugal air cleaner. The fuel tank is under the cowl directly back of the engine space, and fuel is fed by gravity. The engine is set somewhat farther to the rear than is usual and is well balanced between the

12-20-H.P. Machine That Can Pull Three to Four Plows

front and rear axles, which protects against shock as well as helps shorten the wheel-base and reduces the turning radius.

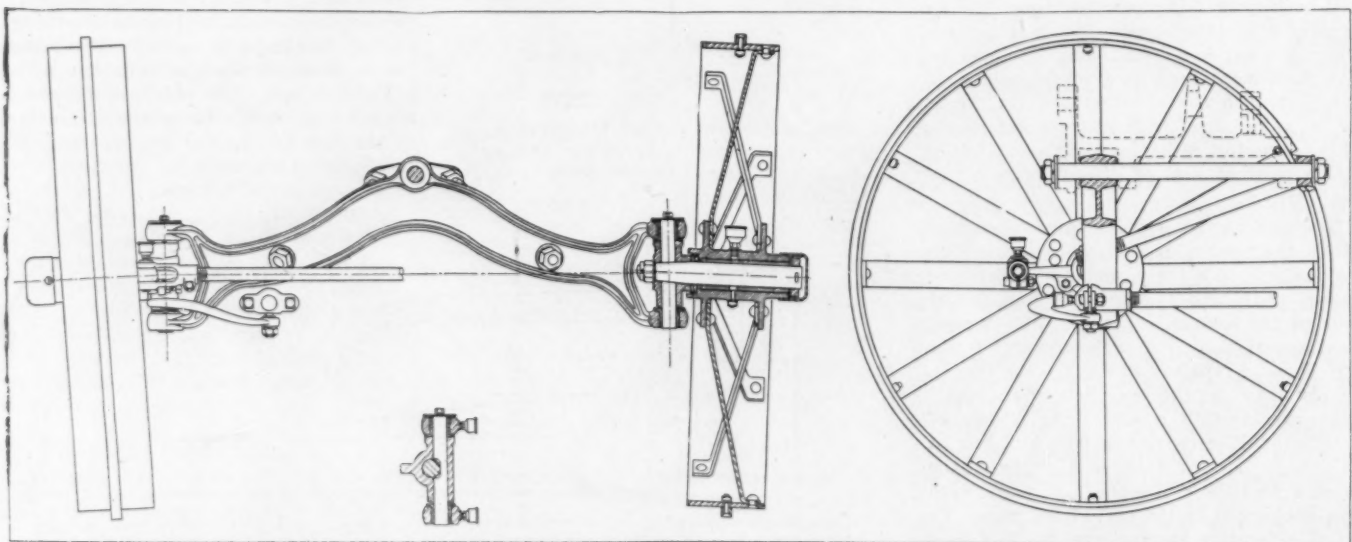
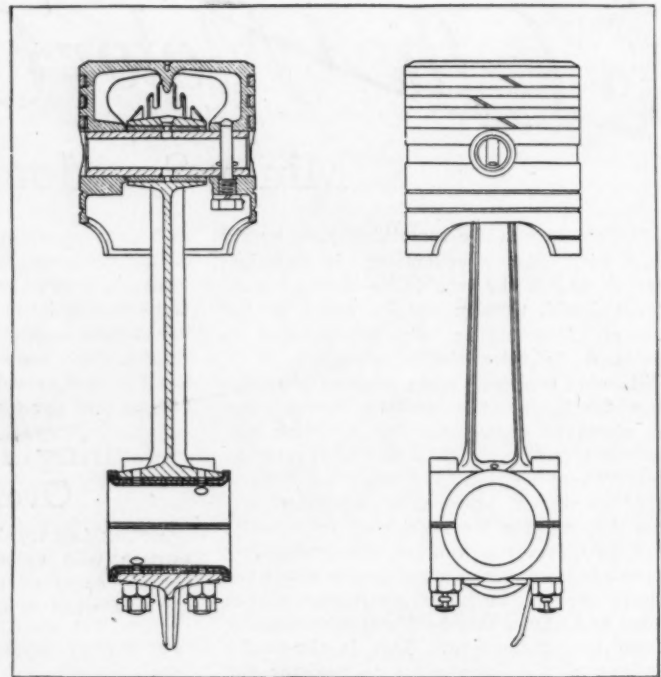
The cylinders are L-head type cast in pairs and of $4\frac{1}{4}$ -in. bore by 5-in. stroke. Normal speed is 900 r.p.m., maintained by a centrifugal governor. The piston displacement is 354.4 cu. in. The valve openings are closed by plates held in place by yokes and set screws, which makes the valves more accessible than if screw plugs were used. The pistons are cast iron with three rings above the wrist pins and three oil grooves on the skirt below the wrist pin.

Connecting Rods

The connecting rods are I-section drop forgings of medium carbon steel with

bronze bushings at the upper ends. The connecting rod big ends are lined with bab-bitt half bushings, and shims are used for adjustment. The crankshaft is supported by three main bearings, $2\frac{3}{16}$ in. in diameter. The length of the main bearings is $11\frac{1}{4}$ in.—front, $3\frac{1}{4}$ in.; center, $3\frac{1}{4}$ in.; rear, $4\frac{1}{4}$ in. All valves are on the left side of the engine. Cams are of the mushroom type forged integral with the camshaft, which is $1\frac{1}{4}$ in. in diameter and supported by three bearings. The two forward camshaft bearings are of such large diameter that the whole shaft can be withdrawn from the front end. The pushrods are set in guides secured in the wall of the crank chamber and are provided with adjusting screws.

Ignition is by K-W high-tension magneto, and cooling is through a Modine Spirex cellular radiator by centrifugal pump, the total capacity of the cooling system being 7 gal. Lubrication is by circulating splash. A considerable amount of



Front axle, front wheels and details of joint between axle and frame of new Emerson-Brantingham tractor

oil can be carried in the oil well, or lower part of the crank chamber, and the level of oil can be seen at any time by an oil gage glass at the side of the crankcase. The oil is circulated by a plunger pump of very simple construction. Oil is drawn into the pump barrel through a bulb-shaped screen of brass gauze and through a ball check valve. The pump plunger is provided with several oil grooves and is actuated directly from the camshaft through an eccentric, being returned by a coiled spring inside the barrel. It delivers the oil through another ball check valve into a horizontal distributing pipe running nearly the whole length of the engine.

The pump barrel is cast with a bracket by which it is bolted inside the lower half of the crankcase. Directly below the pump inlet is a drain plug. Each connecting rod cup has a dipper, or oil splasher, and under each splasher is a trough of circular form. The troughs are arranged in an unusual way. There are two, one for each pair of cylinders, wide enough to take in the two connecting rod heads. The splasher sweeps through a depression in the trough directly underneath it. The object of the depressions is to prevent one rod from going dry when the tractor ascends or descends a grade, as the depression will retain lubricant.

Troughs of Steel

The troughs are made of sheet steel and are secured by hinge pins to pads bolted to the wall of the crankcase lower half. These troughs swing down when the connecting rod bearings are to be taken up. Sheet steel gutters are placed on the inside wall of the crankcase to catch oil draining back and lead it into the depressions in the troughs.

An unusual feature of the tractor is that the transmission casing and rear axle housing are formed in a single casting. The main shaft of the transmission extends forward and directly over the rear axle shaft. It is fluted at its rear end and carries two sliding pinions, each of which may be meshed with one member of the double gear ring, whereby the two forward speeds are obtained. There is also a pair of intermediate pinions for the reverse. The double gear ring is keyed to the secondary shaft which is located underneath the rear axle shaft. At its rear end, outside of the gear housing, this shaft carries a small diameter brake drum and at its forward end it carries a bevel pinion which meshes with a bevel wheel on a cross shaft. On this cross shaft is located the differential gear, which is of the bevel type. At the end of this cross shaft are mounted the bull pinions, which are secured in place by splined fittings. All bearings in the transmission and rear axle, with the exception of those in the reverse idlers, are of the Hyatt flexible roller type. The slight amount of end thrust on the secondary shaft of the transmission, due to the bevel gear tooth reaction, is taken up by a ball thrust bearing. Packings are provided where shafts enter or leave the transmission box, to reduce the loss of lubricant to an absolute minimum. The two reverse pinions are in a single piece and run on a stationary stud, being provided with bronze bushings at both ends.

Operation of the change gear is effected on the selective principle through a ball mounted lever directly on the transmission box. There are two slides and one or the other of these can be picked up at will. The slides are held in the neutral and full

mesh positions by spring-pressed locking dogs of which one is arranged horizontally and the other vertically.

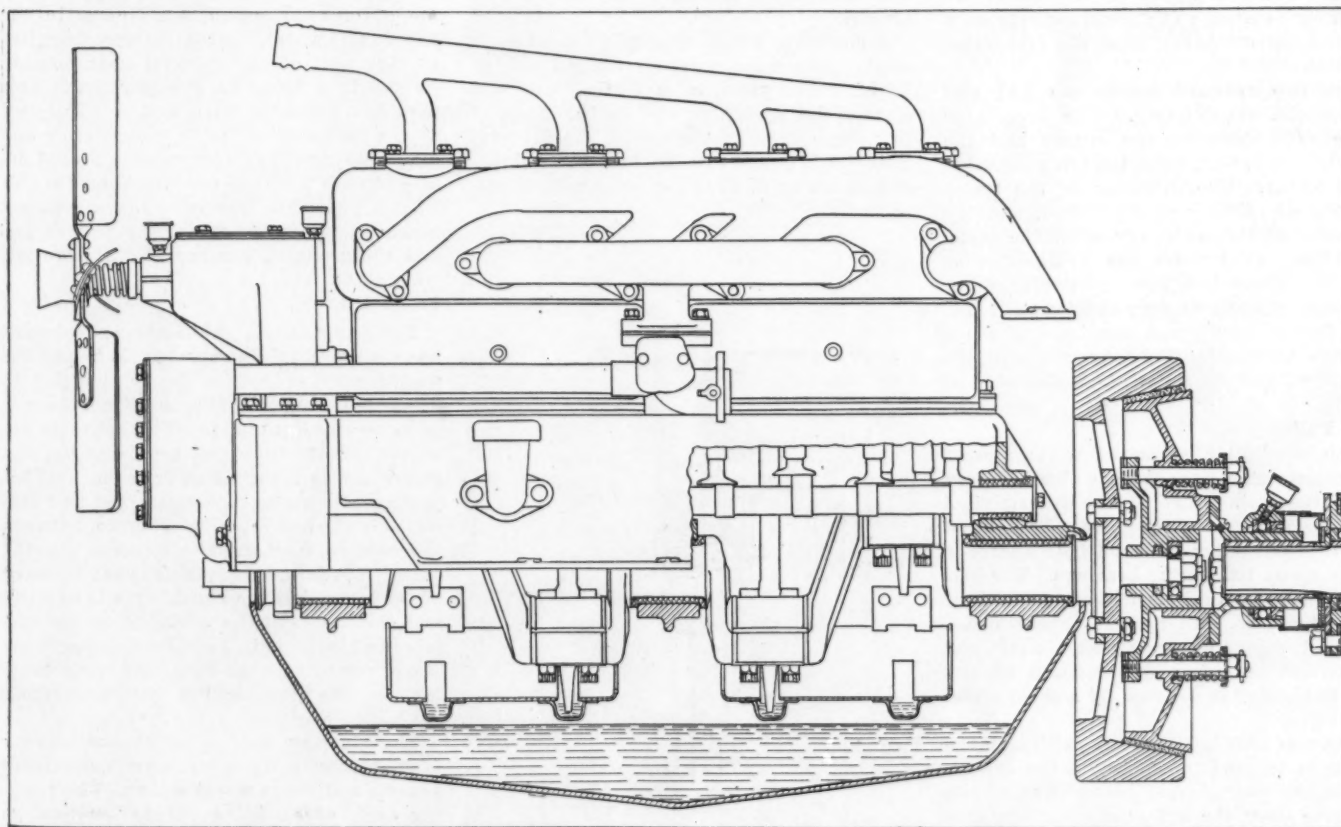
All transmission and rear axle bearings are in a single casting, so that disalignment of bearings in service is a practical impossibility. There is a large opening in the top of the transmission case and a smaller one in the rear of the case. Both of these are closed by steel plate covers.

The engine brake drum at the rear end of the transmission countershaft is only 5 in. in diameter and 2 in. wide. An asbestos-lined band can be contracted upon it by a bell crank mechanism connected to a clutch pedal, which insures equal effectiveness for both forward and backward motion.

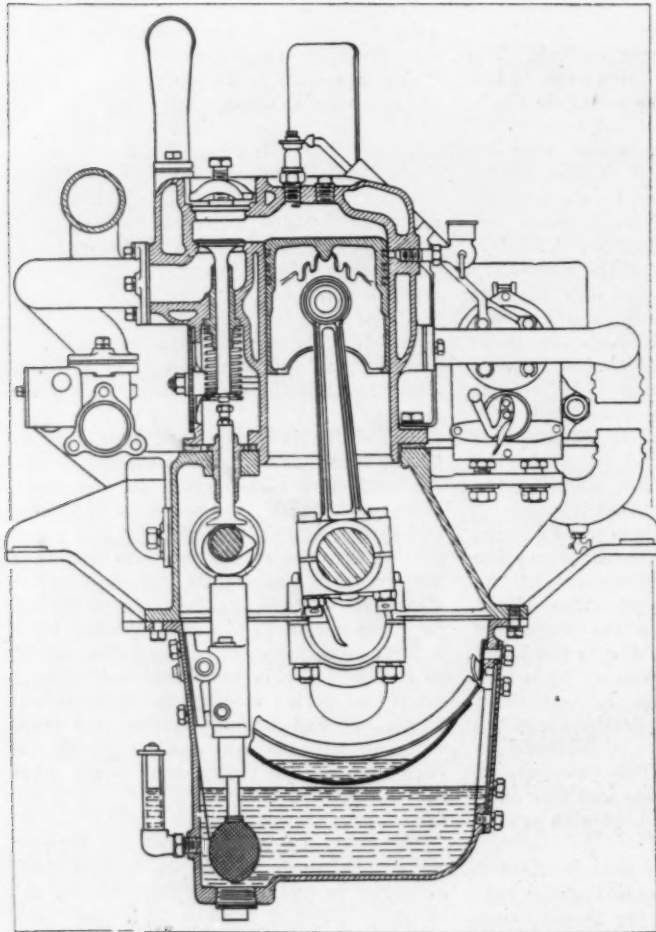
The clutch is of the cone type with asbestos fabric facing. It is supported on a cup and cone ball bearing on the clutch pilot, and there is also a ball bearing throw-out collar. To prevent oil and grease getting into the clutch and onto the asbestos lining, a packing is provided in the pilot hub. There are four clutch springs on studs screwed into the pressure plate, and clutch adjustment can be made readily. A clutch brake is provided, and consists merely of spring steel plate bolted to one frame bar and having its free end faced with asbestos fabric, against which the rear edge of the clutch cone bears when the clutch is withdrawn.

Location of Governor

The governor is carried at the forward end of the camshaft, the two flyballs being arranged in the form of bell cranks the inwardly directed arms of which act on a collar on a plunger. This plunger acts upon a double armed lever which connects by a link to the throttle valve. All the gov-



Side elevation of engine and section of clutch on Emerson-Brantingham 12-20 hp. tractor



Above—Emerson-Brantingham tractor at work in field
Left—Cross-section through Emerson-Brantingham engine

ernor mechanism is fully inclosed, including the adjusting device, which can be reached by removing the cover plate of the governor housing. The governor acts on a throttle valve separate from the carburetor throttle.

The two forward speeds are 1.81 and 2.33 m.p.h. respectively. The high gear drive ratio between the engine and the rear wheels is 61.5:1 and the low gear drive ratio 79.5:1. The diameter of the transmission of primary shaft is 2 in. and the diameter of the secondary shaft the same. The differential shaft has a diameter of 2 $\frac{3}{8}$ in. There is a total of twelve roller bearings in the rear axle and transmission. The transmission gears are made of stock cut and hardened. The rear axle is of the live type, and its shaft has a diameter of 2 $\frac{3}{4}$ in.

Belt Pulley

The belt pulley is located at the rear of the tractor on a cross shaft, which is driven from the main shaft of the transmission through a pair of miter gears. End thrust due to these miter gears on both shafts is taken up on ball thrust bearings. The belt pulley is 12 in. in diameter, has a width of face of 6 $\frac{3}{8}$ in. and runs at engine speed. The miter gear on the thresher shaft can be shifted out of mesh when not in use. The final drive is inclosed by a sheet metal housing.

The rear axle is a live axle, although the power is transmitted direct to the drivers by pinions and internal gears. The wheels are free upon the axle, but since the axle is mounted in roller bearings there is naturally less resistance to the rotation of the

axle in its housing than to the rotation of the wheels upon the axle, and the wheels will turn upon the axle only in turning corners.

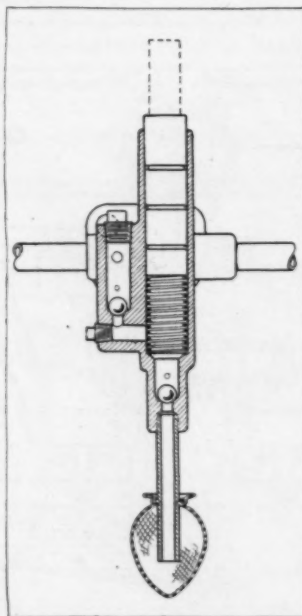
A moderately light type of drive wheel is used. It has an inwardly flanged rim of $\frac{1}{4}$ in. rolled steel, a cast steel hub and sixteen flat spokes riveted to the rim and to flanges cast on the hub. The internal gear ring is bolted to a shoulder on the large hub flange by S. A. E. cap bolts with castel-

lated nuts. The right wheel is provided with a grease cup, and presumably all the motion between wheel and axle required by the differential action takes place in the hub of this wheel. Attention may be called to that part of the internal gear housing riveted to a flange on the gear ring. This part has a beaded edge and is telescoped by the part secured to the transmission and axle housing. The rear wheels are 54 in. in diameter and have a width of face of 12 in. The wheelbase is 87 in., the thread measured to outside of wheel rims 52 $\frac{7}{8}$ in., and the ground clearance at the drawbar, from 10 to 14 in.

Front Axle

The front axle is an I-section steel casting with a prominent upward arch, and has the forward end of the frame swiveled to it at the middle. Diagonal radius rods serve to steady the axle. The knuckles are of the Elliott type and are built up, the axle spindles being fitted into the knuckle castings by means of a taper, nut and cotter pin. To prevent interference between the axle spindle and the knuckle pin the axis of the former is set somewhat forward of the latter, but the knuckle pin is notched and the axle spindle passes below its surface and locks it in position. Grease cups serve to lubricate the bronzed bushed bearings of the knuckle pin in the steering head.

The steering gear is of the motor car type, the reducing mechanism comprising a worm and worm wheel sector. The steering arm, which is of channel section, is formed with a flat or narrow hub by which it is bolted to the worm gear sector. A



Plunger type oil pump

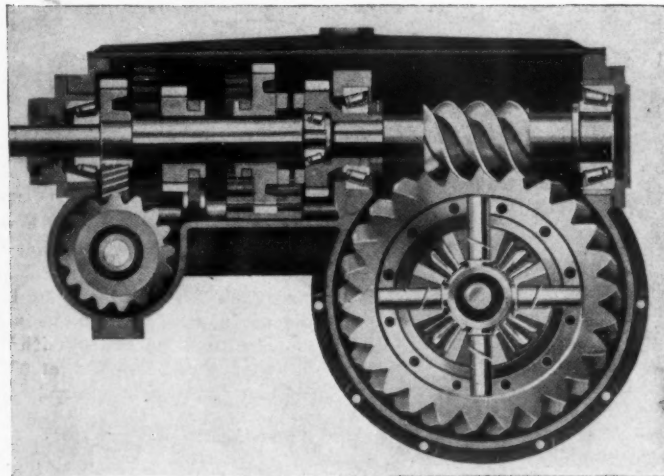
flange cast on the steering gear housing serves to bolt the housing to the frame bar. To stiffen the steering support a 1½-in. shaft is passed through the hubs of the worm wheel sector and steering arm and is extended through a bearing on the opposite frame bar. It will be seen that the worm gear sector has really a double support, in the bored-out hub formed on the gear housing cover plate, and on the shaft extending across the frame. Owing to the considerable distance between the two bearings supporting the cross shaft, any slight wear in them will not make the steering arm perceptibly shaky. The worm is secured to the steering shaft by a taper pin, and thrust washers are provided at both ends of the worm.

The frame is made of 6 by 2 by 3/16 in. channel steel. The front wheel hubs are bushed, and thrust washers are provided at both ends. The steering tie rod extends in front of the axle and has the usual forked connections, while the drag line is provided with ball and socket connectors, the socket being made in halves which are bolted together. There is considerable camber to the front axle, something like 5½ deg., the object evidently being to confine the end thrust as much as possible to the inner end of the hub. The front wheels are 36 in. in diameter and have a 6-in. face. They are provided with a central skid ring secured to the rim by plow bolts, square nuts and spring washers.

DEMMLER TRACTOR TRANSMISSION

The sliding gear transmission combined with worm drive for tractors, manufactured by the Demmler Mfg. Co., Detroit, is so constructed that the transmission housing is combined with the housing of the worm gear on the rear axle, thus making the transmission and the final drive a single unit. Tapered roller bearings on all shafts make it unnecessary to provide special bearings for end thrust. The reduction ratio of the worm gear set is 14½ to 1. In plowing all the gears in the transmission are idle. Low-speed ratio is three-fourths of the plowing speed ratio.

The pulley shaft is driven through hel-



Demmler tractor transmission and worm drive

ical gearing from the main shaft of the transmission, and while the tractor is delivering power to the belt no transmission gears are in mesh. The speed of the belt pulley shaft is the same as that of the main transmission shaft.

DEALERS TO HELP HARVEST

Kansas City, Mo., June 21—Two thousand of the 4000 men obtained in this city to help harvest were mechanics and clerks who were badly needed in their city jobs. The motor car dealers responded nobly. Albert E. Hoyt, manager of the Kansas City retail Chevrolet, said he would close his service station a month if needed. All his service shop men enlisted, though all have not been called out for the harvest.

J. F. Martin, manager of the Buick branch, donated the services of three men for two weeks, paying their salaries while they were gone.

The Ford Motor Co. contributed 10 per cent of its working forces. The men will go in groups, so that not more than 10 per cent will be gone at a time and for not longer than two or three weeks. The other employees will work overtime to get the work of the absentees done.

The Garford Motor Truck Co. will close

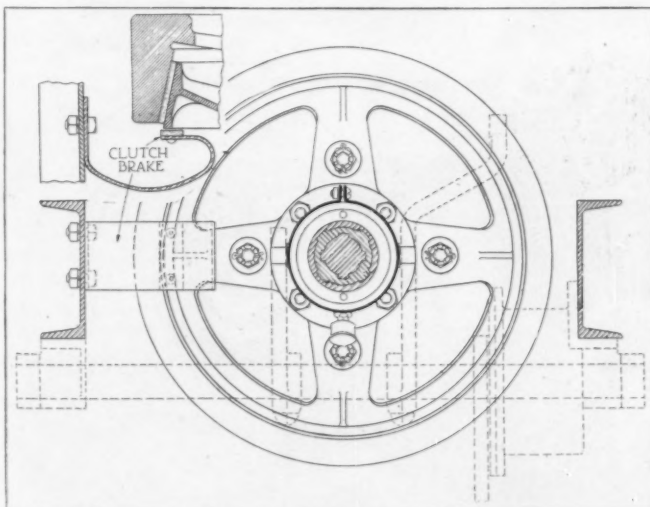
entirely and all its workers will go to the field in case of the emergency call.

The Greenelase Motor Car Co., Cadillac dealer, arranged for 40 per cent of its mechanical forces to help on the farms during the season.

Six from the General Motors Corp. of Missouri signed up. Six from the Dougherty Motor Co., Republic truck distributor, signed for tractor work. Allen & Jackson Motor Co. will let four mechanics off at a time for the harvest. All but one mechanic, who was not a farmer, and salesmen from the Grant Motor Sales Co. enlisted. Three men from McDowell Motor Co., Paterson dealer, and three from the Cole agency signed. The men are given vacations, usually without pay, for such farm work, and their positions are held for their return.

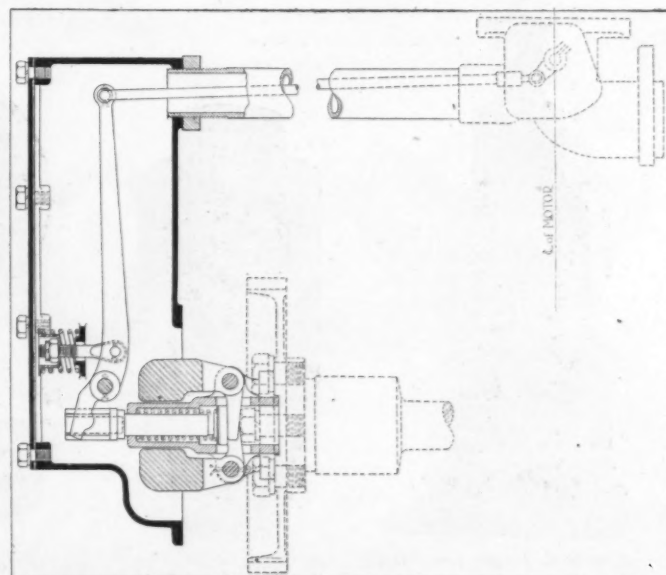
USED CAR REPORT ISSUED

Chicago, June 21—The seventeenth edition of the National Used Car Market Report has been issued by the Chicago Automobile Trade Association. Cars that have been added are the Commonwealth Harroun, Moore and States. Cars that have been dropped are Benz, Meteor, Michigan, Palmer, Singer, Rayfield, Selden, Woods Dual Power and Columbus electric.



Above—Rear of Emerson-Brantingham clutch with brake detail

Right—Engine governor on new Emerson-Brantingham



The Accessory Corner

Rain-A-Way Pad

THE Rain-A-Way pad consists of a small felt pad treated with a special solution for rubbing over the windshield. The pad leaves an invisible film on the glass, which sheds the water. The pad is not greasy and is non-evaporating. When not in use it can be slipped in a side pocket of the car.—Badger Mfg. Corp., Milwaukee, street, Milwaukee, Wis.

Comoncense Economizer

The Comoncense starter and economizer is a device for supplying preheated air to the cylinder of an internal combustion engine. One end of the heater is inserted in the air intake of the carburetor and the other end in the flexible tube which regularly carries the hot air taken from the exhaust manifold to the air intake of the carburetor. Flexible wires are attached to the terminal posts and then to the battery and dash switch so that the heater can be controlled from the driver's seat. The device comes complete with wire, terminals, dash switch, etc. Price, \$10.—Charles H. Belknap, 46-48 Fulton street, Brooklyn, N. Y.

Pla-Safe Brake

The Pla-Safe brake is a large brake easily attached to the rear hub drum, it is said, with no drilling of holes and in less than an hour. It is an emergency brake for Ford cars and is lined with high grade lining and guaranteed to stop the car and hold the load on any hill. Price, \$10 a set.—Pla-Safe Co., Brookville, Pa.

Cuno Combination Lamp

The Cuno combination dash and trouble lamp is mounted on the dash and at the same time is instantly available as a trouble and inspection lamp to read road signs,

guide maps, house numbers, etc. A powerful bulls-eye lens is fitted. The cord automatically rewinds and can be locked at any length. All metal parts on the dash are highly polished and nickel plated. Two sizes are furnished. The lamp can be placed in any position, it is claimed, and can be used in series with the taillight. Four types are supplied, at \$3.75 and \$4.25.—Cuno Engineering Corp., Meriden, Conn.

Klear-Sight

Klear-Sight is a windshield cleaner. It consists of a small device operated by an easy motion across the windshield, which clears away rain, mist or snow quickly. Price, \$2.—U-Auto-C Corp., 2156 Broadway, New York.

Commercial Car Bodies

This line of truck bodies is made to fit the Ford 1-ton truck or any truck attachment for the Ford chassis. Type No. 15 is made expressly for commercial purposes of all kinds—waterworks, gas and telephone companies, grocers, farmers, etc. The body is built according to the company's standard form of frame construction. Each piece

is made of thoroughly seasoned hardwood, straight-grained lumber and securely bolted. The reinforced construction—six cross beams and two body sills which rest on the frame of the car, two upper sills upon which the body is constructed—is mortised, tenoned, glued and bolted together with twenty-eight bolts. Necessary irons for attaching frame to the car are included. The panels of the body are 10 in. high, with 5½-in. white oak flareboards. A drop end gate is equipped with end gate chains. The same body also is furnished with 18-in. panels, eliminating the flareboards. The seat is full width, and a loading space 43 by 63 in. is provided. The top is of ¼-in. oak-beaded ceiling, covered with waterproof material and is equipped with roll curtains at sides and rear. Finish is dark olive green or golden brown, striped with black. The approximate shipping weight is 470 lb. The concern also offers panel commercial bodies, slip-on bodies for Ford roadsters, all-season panel bodies, stake bodies, express bodies, etc.—Auto Body Works, Appleton, Wis.

Standard Traffic Post

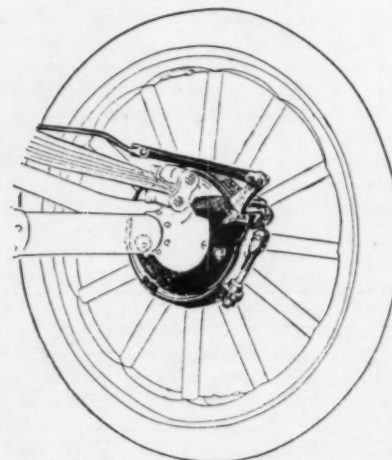
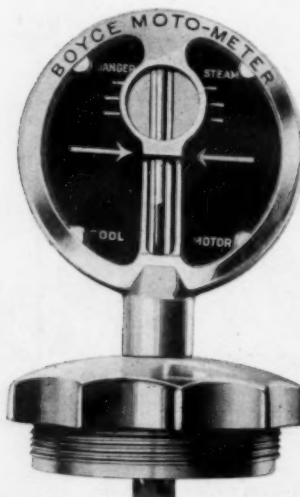
The Standard traffic post is 7 ft. high from the base to the tip of the ball and is 30 in. square at the base. The post is of cast iron and weighs approximately 600 lb. The upper red glass is illuminated at night for traffic purposes, as well as a panel of white glass for use in community advertising, town boosting, etc. The post is installed and lighted on long-term contract free of charge to cities, and the name of the street and other directions for motorists can be applied.—Municipal Appliance Co. of Wisconsin, Inc., Edgerton, Wis.

Adjustable Spark Plug

The Blu-Streak plug is an adjustable spark plug. The electrode is insulated with

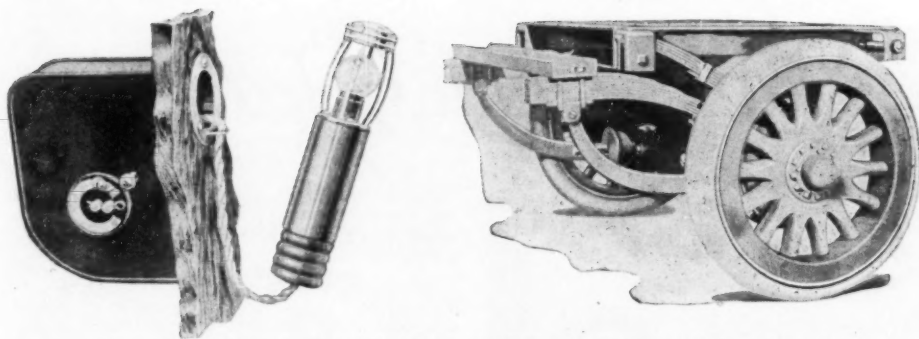


Rain-A-Way pad for windshield



Standard traffic post, left; Comoncense starter and economizer, center; and Boyce Moto-Meter for Ford cars, right

Pla-Safe brake for Ford rear hub drum



Cuno combination dash and trouble lamp, left, and Knox traction equipment

mica, 50 in. being wrapped lengthwise around the electrode. The adjustable feature is seen through a little window. Should the firing points become covered with carbon, it is only necessary to turn the upper electrode two revolutions with the fingers, start the engine and the carbon will burn off, it is claimed. Other features are the heavy solid steel shell, Bakelite dome and fishhook electrode, which keeps the oil drip away from the firing points.—Cumming-Forster Corp., Chicago.

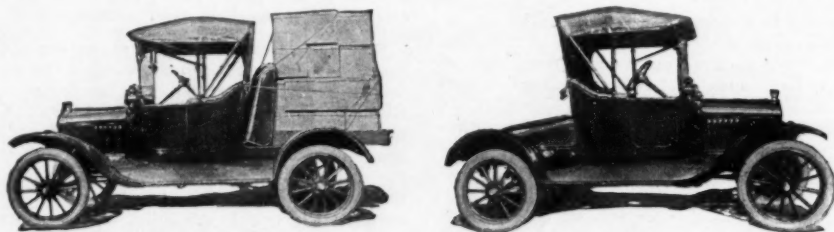
Anthony Dump Body

The Anthony rocker dump body is built for application to the standard 1-ton Ford truck. The device is attached to the truck frame without any alteration of the chassis or drilling or holes. It is automatic in action, the dumping being accomplished by releasing the latch. The body is restored to the horizontal position instantly upon disposal of the load. This is brought about by the use of cams on inverted V-shaped racks, which are fastened to the chassis by bolts passing through the standard holes in the rear cross member of the chassis. At the front the racks are located on brackets, which in turn are fastened to the chassis frame by U bolts. The eccentric

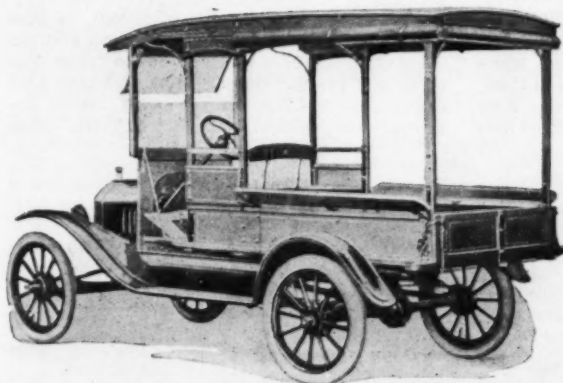
load devolving upon these brackets is taken care of by a rod which fastens both brackets together at points above the frame. It is possible to arrest the body movement at any angle and hold it there, it is said. The angle of dumping varies from 48 to 50 deg. The tail gate is operated automatically as the body tips backward and by a lever at the driver's seat when relatching. In the horizontal position the body is locked to the frame at three points. In the case of an all-purpose truck a platform can be substituted for the steel body by the removal of a few bolts which secure the body to the under frame.—Anthony Co., Inc., Streator, Ill.

Utility Disappearing Truck

The Utility disappearing truck is for application to a Ford roadster, which in 2 sec., it is said, can be converted into a ½-ton truck and back again. The truck is completely out of sight under the original turtle back of the Ford. Installation can be made in an hour with a hammer and wrench. Only four bolts are used in attaching it. With a slight start the turtle back opens or closes automatically. When the truck is in use the turtle back lifts up and protects the back of the seat from



Utility disappearing truck body, shown open and closed



Commercial car body made by Auto Body Works, left, and Anthony rocker dumping body, right

scratches. The truck is made of heavy-gage steel, finished in black enamel and can be pulled out to the desired length. The body is acetylene welded, without bolt or rivet. Price, \$32.50.—Hill Pump Valve Co., Archer avenue and Canal street, Chicago.

Knox Tractor System

The Knox tractor system includes traction units with trailers for use in connection with them. Semi-trailers are constructed in 2, 3 and 5-ton capacities, and the trailer axle equipment makes possible the construction of a new trailer a simple matter. The equipment consists of a pair of heavy artillery wood wheels fitted with solid rubber tires; a solid round axle specially designed for semi-trailer work; and a pair of semi-elliptic springs complete with brackets. Each unit is designed for a certain capacity of semi-trailer. Extension trailers also are supplied. Price, semi-trailers, 2-ton, \$475; 3-ton, \$625; 5-ton, \$750; trailer axle equipment, \$310, \$435 and \$535; extension trailer, \$450, \$600 and \$777.—Knox Motors Associates, Springfield, Mass.

Moto-Meter for Fords

A new model Moto-Meter for Ford cars has been brought out. It is complete with nicked radiator cap and registers the temperature of the air and steam above the level of the water in the radiator, warning of danger, such as a leaky piston ring, warped valves or empty oil reservoir. Four models have been announced previously—the Standard, the Overland, the Junior and the Midget. Price, Ford model, \$2.75.—Moto-Meter Co., Long Island City, N. Y.

Bolt and Tap Set

The Stevens' bolt and tap set contains ten oversize cylinder head bolts and a special tap. This is for emergency use in the stripping of bolts. Another feature recently announced is a Simplified Accounts file for use in connection with Stevens' repair tags. It has three divisions, one for tags on jobs which have been delivered and paid for, another for tags on work delivered but charged and the third for new tags. Price, bolt and tap set for Fords, \$2.—Stevens & Co., 375 Broadway, New York.

Among the Makers and Dealers



GARFORD TANK AIDS AUSTRALIA DRIVE—Standard Garford truck chassis with reproduction of tank, which was used in the sixth war loan drive in Australia. The tank is shown in front of a Sydney bank. The governor of New South Wales is speaking from the tank

SAGINAW Malleable Adds \$250,000—The Saginaw Malleable Iron Co., Saginaw, Mich., has increased its capital stock from \$400,000 to \$650,000.

Mather Spring Increases Capital—The Mather Spring Co., Toledo, Ohio, has increased its capital stock from \$300,000 to \$1,000,000, and the Mather Mfg. Co. has increased its capital to \$600,000.

California Chevrolet Record for May—During May the Chevrolet Motor Co. of California, Oakland, Cal., turned out more than 1200 complete touring cars and roadsters, as well as light delivery vehicles.

Bearing Service Branch Changes—Carl R. Jones, branch manager for the Bearings Service Co., St. Louis, Mo., has enlisted in the Navy, and L. H. Ware, assistant manager, has been promoted to the management.

Globe Seamless Tube Will Add—The Globe Seamless Steel Tubes Co. of Milwaukee, Wis., will increase the size of its works more than 50 per cent by the erection of two additions, 130 by 170 ft. and 130 by 250 ft., of fireproof construction. Three 10-ton electric cranes will be installed.

Winther Truck Will Build Plant—The Winther Truck Co., originally organized at Kenosha, Wis., but operating in a leased factory group at Winthrop Harbor, Ill., just south of the city, has completed arrangements for the erection of its proposed new plant in Kenosha. The company is executing extensive contracts for military trucks and requires greatly increased facilities.

Columbus Tractor to Acquire More Land—The Columbus Tractor Co., Columbus, Ohio, has practically completed arrangements for several additions to its plant. An option has been obtained on a 10-acre tract adjoining the present plant, and added factory units will be constructed. The concern was recently organized with a capital of \$1,000,000 to manufacture the Farmer Boy tractor and has taken

over the plant and assets of the McIntyre Mfg. Co. It is the plan of the company to eventually manufacture every part and casting that goes to make up the tractor.

McDonald to Enlist 100 Drivers—Steward McDonald, vice-president and general manager of the Moon Motor Car Co., St. Louis, Mo., has undertaken to enlist 100 men drivers for work in France.

Gamble to Superintend Deere Works—C. H. Gamble, sales manager since 1913 of the John Deere Plow & Tractor Works, Rock Island, Ill., has been appointed superintendent to succeed A. H. Head, called to Washington, D. C., to assist the War Department in the production of airplanes. Mr. Gamble commenced service with the Deere concern in 1906 in the experimental department.

Swinehart Manager for Hewitt Department—B. C. Swinehart has been appointed manager of the motor truck tire department of the Hewitt Rubber Co., Buffalo, N. Y. For the last eight and a half years Mr. Swinehart has been with the Republic Rubber Co., Youngstown, Ohio, and six years prior to that with Swinehart Tire & Rubber Co., Akron, Ohio.

Mayo Radiator Division Moves—The Mayo radiator division of the Marlin-Rockwell Corp. moved its entire factory June 1 from New Haven, Conn., to New York. A five-floor fac-

tory, occupying an entire city block, provides for more than double former capacity. H. B. Gordon is general manager, and Richard Taylor sales manager.

Silver Salesroom on Fifth Avenue—C. T. Silver, Inc., New York distributor of Kissel and Apperson cars, will open a branch salesroom at 509 Fifth avenue July 5. It is Silver's idea that the high-class clientele to which he caters will be best reached by a salesroom in such a location.

Perfex Radiator to Build New Plant—The Perfex Radiator Co., Racine, Wis., which recently increased its capital stock to \$1,000,000, is contemplating the erection of a new plant, 125 by 300 ft., with a complete new equipment of machinery and tools for the manufacture of motor car, truck and tractor radiators. At present the company occupies leased quarters with limited opportunity for necessary expansion.

Gavin to Manage Chippewa Rubber—E. C. Gavin, for nearly ten years general superintendent of the Chicago Rubber Clothing Co., Racine, Wis., which is a large manufacturer of inner tubes for pneumatic casings, has resigned to assume the management of the Chippewa Rubber Co., Eau Claire, Wis., of which he is vice-president. Mr. Gavin is succeeded by W. H. Peters, Newark, N. J. During his period of management the Racine concern has reached an output of 3000 inner tubes a week.

Western Rope Doubling Foundry—The Western Rope & Mfg. Co., Tulsa, Okla., and Milwaukee, Wis., is doubling the capacity of its gray iron foundry at Cedarburg, Wis., which is devoted entirely to the production of castings for the gasoline engines manufactured at the Milwaukee works. The company manufactures a variety of oil-well equipment, hoists, motive power, etc., and acquired the gas engine plant in Milwaukee last fall. The Cedarburg foundry was purchased early last spring, having previously given its entire output to the concern under contract.

Fire Loss Leads to Fire Prevention—Probably the first instance on record of the forming of a voluntary association for fire prevention by the tenants of a multiple occupancy building is the organization effected by lessees of various units of the Racine Industrial Plant, formerly the main works of the Racine-Sattley Carriage Co., Racine, Wis. The mammoth group is occupied by a variety of concerns of more or less importance in the automotive industry, one of the main tenants being the Wallis Tractor Co. This concern recently sustained a fire loss, which led to the forming of a permanent fire prevention body. A paid inspector will be employed to take complete charge of all fire protection and fire prevention features throughout the group. The owners of the building are now replacing 3,000 automatic sprinkler heads with latest approved devices and will install thirty-three



KISSEL HELPS BUILD HIGHWAYS—Heavy-duty Kissel truck pulling a 8-ft. grader. Motors are becoming more and more important in road work

approved fire doors on eighteen openings in division fire walls, separating the main group of buildings into five distinct sections practically immune from intercommunicating fires.

Haynes with Westinghouse Electric—W. A. Haynes has been appointed manager of the automotive division of the Detroit office of the Westinghouse Electric Co., succeeding Major Hawxhurst, resigned.

Manship Heads Hurlburt Branch—Nelson A. Manship has been appointed manager of the branch of the Hurlburt Motor Truck Co. at Newark, N. J. He has been associated with the Hurlburt company for the last two years.

Sweeney Joins Paige-Detroit—J. B. Sweeney, formerly with Theodore F. MacManus, Inc., Detroit, advertising agents, has been appointed assistant advertising manager of the Paige-Detroit Motor Car Co., Detroit, succeeding A. W. Schalbach.

New Plant for Vim Truck—Work on the addition to the plant of the Vim Motor Co., Sandusky, Ohio, maker of the Vim trucks, has been started. The addition will be 80 by 100 ft. and will be a portion of a new unit having 130,000 sq. ft. of floor space.

Porter at McCook Field Now—Finley R. Porter, formerly chief engineer of the Mercer Motor Car Co. and afterward designer of the F. R. P. cars at Port Jefferson, L. I., has joined the Government establishment at McCook field, Dayton, Ohio, as airplane engineer in charge of engine development.

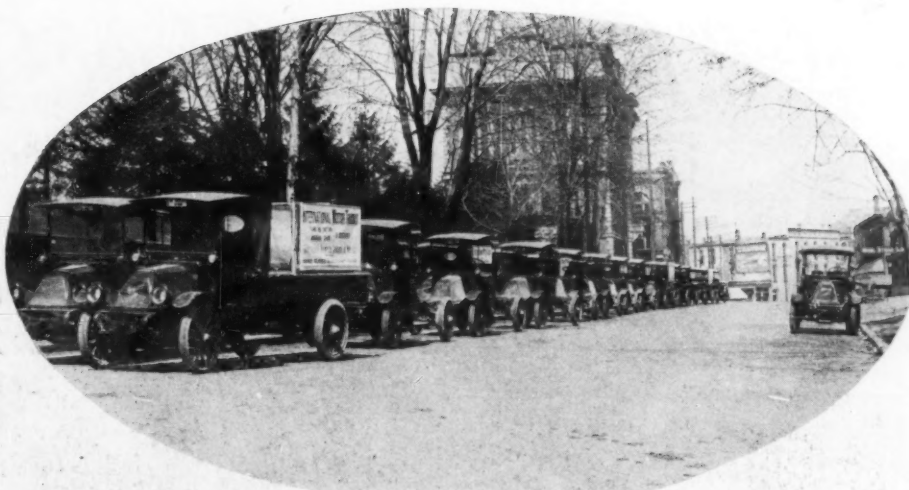
Greene with Marathon Tire Now—William J. Greene, formerly with the Vul-Tex Co., Barberton, Ohio, has joined the sales force of the Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio, in charge of the department of soles, heels, belts and specialties. A large addition for the manufacture of these lines recently has been completed.

Wade Joins Studebaker Forces—Fred A. Wade has been appointed purchasing agent of the motor car division of the Studebaker Corp., with headquarters at Detroit. He will take up his new duties July 1, having resigned as superintendent of purchases of the Buick Motor Co., Flint, May 25. He was purchasing agent of the Ford Motor Co. in the early motor car days, and later with the E-M-F company and the Studebaker Corp.

Miller Now with Harroun Motors—Bert Miller, former general foreman of the heat-treating department of the Studebaker Corp., Detroit, has joined the ordnance department of the Harroun Motors Corp., Wayne, Mich., as superintendent of heat treating. Prior to his connection with the Studebaker, he supervised heat-treating plants for the Government at the Washington Navy yard and the Panama Canal zone.

Des Moines Adopts War Measures—Twenty-two Des Moines garages and motor car repair shops have formed an agreement to close their shops at 6 p. m. each week day and all day Sundays and holidays. The early closing is being advertised on a co-operative basis by the twenty-two shops as a war measure. No repair work or accessory sales will be made after 6 p. m. daily, but there will be employees sufficient to handle the storage of cars.

Perma-Loc Buys Factory—The Perma-Loc Mfg. Co., Wilkes-Barre and Scranton, Pa., which manufactures and assembles a variety of motor car accessories, has purchased for \$35,000 the plant of the Wyoming Valley Cutlery Co., Wilkes-Barre, and will take it over to manufacture the Perma-Loc heatless tire patch and line of accessories. New officers of the company have just been elected as follows: F. S. Kuschel, president; George Weaver, vice-president; Frank Guppy, secretary; G. B. Myers, treasurer. F. M. Harrington, formerly in charge of the general sales office in Scranton, will be general manager,



INTERNATIONAL HARVESTER TRUCKS ON ROAD—Driveaway of forty-two International Harvester trucks that made the trip from Akron, Ohio, to Chicago this spring. The distance is 425 miles

and the sales office will be established in Wilkes-Barre, branches being maintained in Philadelphia, Pittsburgh, Scranton and Altoona, Pa., and Boston.

Rowe Truck Moves Organization—The Rowe Motor Mfg. Co., which produces motor trucks, has moved its entire organization from Downingtown to Lancaster, Pa.

Reo Declares Quarterly Dividend—The Reo Motor Car Co., Lansing, Mich., has declared the regular quarterly dividend of 2½ per cent on the common stock to stockholders of record June 15.

Deem to Direct Lane Production—Wesley Deem, former production manager of the Columbia Motors Co., Detroit, has been appointed production manager of the Lane Motor Truck Co., Kalamazoo, Mich.

Michigan Drop Forge Declares Dividend—The Michigan Drop Forge Co., Pontiac, Mich., has declared a quarterly dividend of 1½ per cent on the preferred stock, payable on July 1 to stockholders of record June 15.

Jeffery-DeWitt Plans Extension—The Jeffery-DeWitt Co. has purchased 1½ acres of land adjoining its plant, and preparations are now under way for extensive additions to the present plant. The increased demand for spark plug porcelains necessitated the purchase of this property.

Sunderman Moves Engineering Force—The offices and engineering force of the Sunderman Corp., formerly located at Detroit, have been moved to Newburgh, N. Y., where the corporation has erected a factory, foundry and office building and where the Sunderman carburetor hereafter will be manufactured. The laboratory will remain in Detroit.

Large Distributors Appointed by Jordan—The Mitchell-Lewis-Staver Co., Portland, Ore., will represent the Jordan in the Northwest, with headquarters at Portland and distributing houses at Seattle and Spokane. The Mitchell Automobile Corp. of Missouri, St. Louis, will distribute in the St. Louis territory. Crawford, Jenkins & Booth, Ltd., with headquarters at Shreveport, La., will control Louisiana and Mississippi.

Philadelphia Garage Expects to Raise Prices—Members of the Philadelphia Garage Association expect that beginning Sept. 1 an increase of at least 10 per cent will be made in storage charges; that charges also will be increased on repairs, and that, on account of the high cost of labor and the difficulty of obtaining men to do the work, night washing of cars will be abandoned for the duration of the war. At present night washers demand and are being paid \$25 a week. As early as

next month, it is also expected that an agreement will be made among the members of the association to charge \$14 a month live storage on Ford cars, instead of \$13 as at present.

Parrett Tractor Buys Plant—The Parrett Tractor Co. has purchased the former plant of the Central Locomotive and Car Works in Chicago Heights, Ill. The consideration was \$250,000. This plant consists of four one- and two-story buildings, occupied as machine shop, erecting shop and warehouses.

Standard Truck Business 100 Per Cent More—During the last six months business has increased so rapidly for the Standard Motor Truck Co., Detroit, that, outside of Government work, an increase of 100 per cent has been made. The capital has been raised from \$50,000 to \$500,000, and expansion is to be made. The officers are: President, A. Fisher; vice-president, U. A. Fisher; secretary and treasurer, F. J. Fisher; and general sales manager, J. A. Holihan.

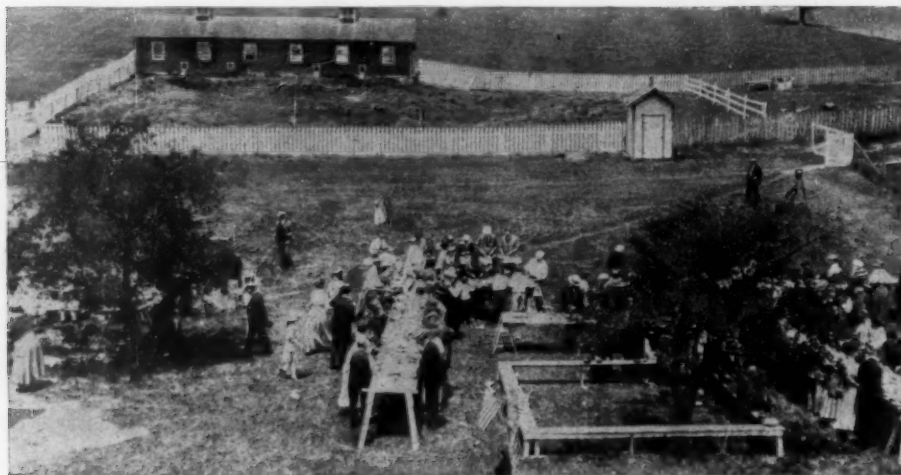
Cutler-Hammer Increases Casting Capacity—The Cutler-Hammer Mfg. Co., Milwaukee, Wis., which is devoting practically its entire capacity to the manufacture of electric controlling devices for the United States Navy, is building a combination foundry at a cost of about \$15,000, to meet the increased requirement of castings of all kinds. The company is unable to obtain castings in sufficient quantities through its ordinary channels and therefore is providing some of this capacity in its own plant.

McCord Appoints District Managers—The McCord Mfg. Co., Detroit, has appointed five new district managers to work under the direction of H. E. Westerdale, manager of the Heath-Duplex division of the company, in distributing the Heath-Duplex attachment for Ford cars. They are Ward Kellar, who will supervise Eastern territory; Frank Pilling and Henry Belcher, to cover the Middle West; J. A. Fields, in charge of the Northwest, and E. W. Nicholson as resident manager of the Pacific Coast territory, with headquarters in San Francisco.

New Men at Aluminum Castings—Howard Emery, who was manager of the Detroit plant of the Aluminum Castings Co. some years ago and later transferred to the managementship of the Manitowoc plant, has returned to the Detroit plant to occupy the position of manager recently vacated by Charles B. Bohn. He has been connected with the company thirteen years. Arthur Birge, previously manager of the Ames Tool & Shovel Co., Anderson, Ind., has replaced R. F. Dyer, recently resigned, and is now assuming the position of district sales supervisor.

From the Four Winds

Chicago Club Takes Day Off



Scenes from the day that the Chicago Automobile Club staged a run down in Indiana. "Pop" Herendeen, president of the club, is shown demonstrating an ear of corn



TRANSFER Company Motorizes Service—The Reading, Pa., branch of the Union Transfer Co., has decided to motorize its entire service, and the horses will be disposed of as soon as possible. White trucks at present are being given a tryout in the company's baggage express service.

Philadelphia War Chest Filling Up—The War Chest campaign of the motor car and allied trade groups of Philadelphia, of which Lee J. Eastman, president of the Packard Motor Car Co., is director, obtained \$95,000 in subscriptions before the middle of the month. The minimum quota is \$150,000, and the campaign will be continued for some time.

War On for Horse Owners, Too—If it's any consolation, the owners of horses are going to be as hard up for service this summer and for the duration of the war as are the motor car owners. The Kansas City Veterinary College, founded in 1891 and open almost continuously since, has closed its doors for the duration of the war. The college has had an average enrollment for several years of between 600 and 700, but this year it had less than 300. More than two-thirds of the 1918 class has entered the service and many of the underclass men also have enlisted. A large number of these vets have gone in in their capacity as professional men, though many others have gone in as soldiers. The

effect of this withdrawal of veterinarians is likely to be far-reaching on the supply of horses and in the efficiency of those which survive. Even without the disaster of an epidemic, it is realized that the veterinarian is even more important for the care of horses in any community than is the mechanic for the upkeep of motor cars.

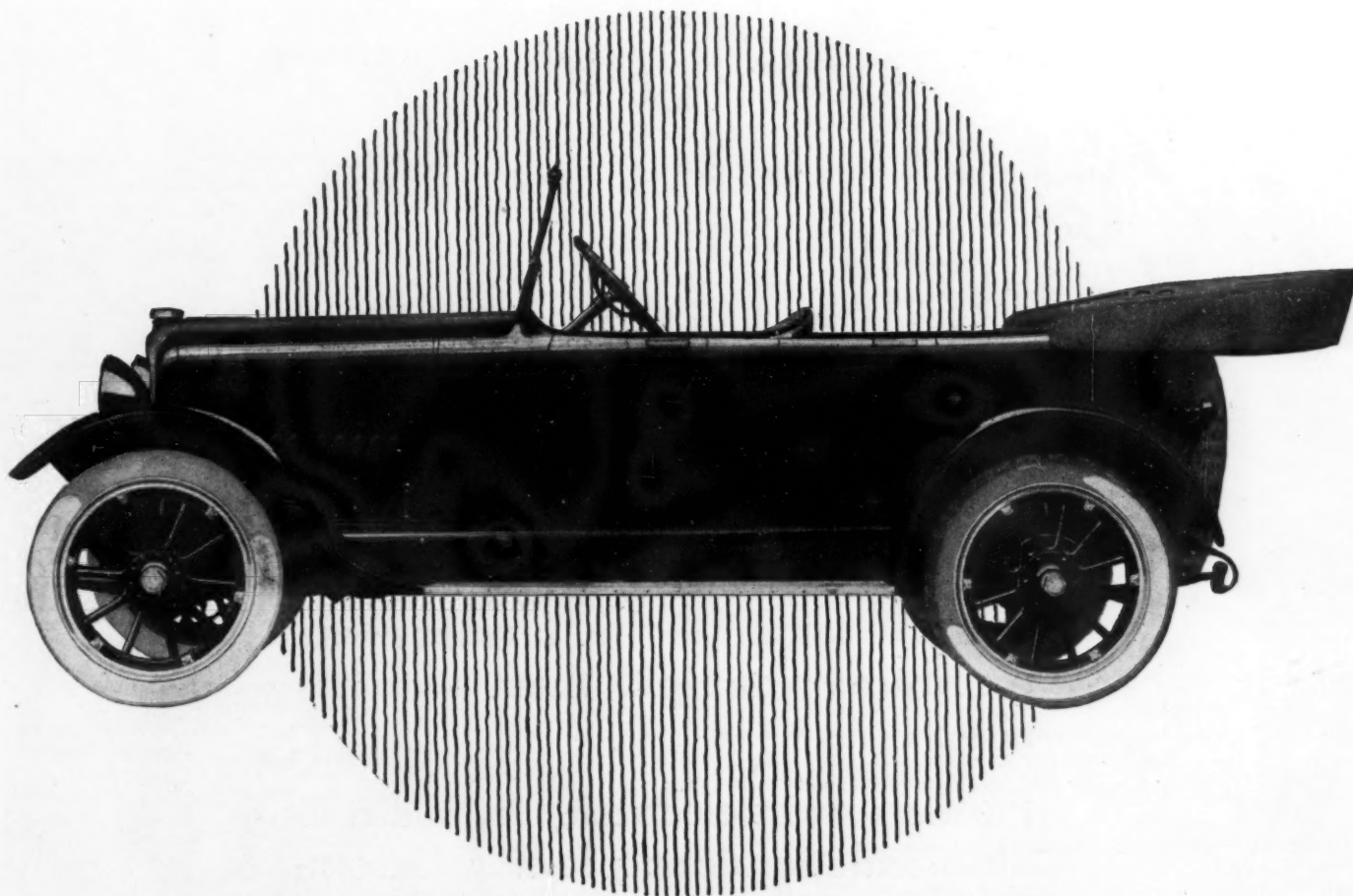
Delaware A. A. Forms Vigilance Committee—The entire membership of the Delaware Automobile Association, which covers the entire state, has constituted itself a vigilance committee, the purpose of which is to watch for violations of the motor laws and to co-operate with the authorities in an effort to correct the infractions and enforce the laws justly. This plan was decided upon at the semi-annual meeting of the association. A courteous letter is to be addressed by Secretary C. G. Guyer to the reported offender, while a second offense will be dealt with more sternly.

Would Weigh Overloads, But Can't—County Commissioners are without authority to purchase scales on which to weigh wagons and trucks believed to be overloaded, according to Attorney General McGhee. The matter came up from Cuyahoga county, where the commissioners believed that much damage was being done to the improved roads by overloaded trucks. The law of Ohio provides

for limit on loads and to ascertain if the law was being violated the commissioners wanted authority to purchase scales. It was proposed to install three scales in various parts of the county to see who was violating the law.

Moves His Household Goods Overland—The inability of A. G. Hight, of Freeport, Ill., to induce the railroads between Toledo and Freeport to ship his household goods resulted in his use of two motor trucks. He drove out of Freeport on Saturday, made the run to Toledo, loaded his furniture and other articles and was back by Tuesday evening following, requiring but four days to make the round trip of 600 miles.

Farmer Tries Out Tractor Hauling—An example of what can be done when the roads are passable was illustrated when J. J. Bowman, a farmer residing 7 miles northwest of Galesburg, Ill., hauled three wagonloads of oats with a tractor, making the round trip of 14 miles in 5 hr. The trip was experimental. Bowman found that he could have handled four or five loads just as easily as three. It is expected that the use of tractors in handling grain and stock will become more general, superseding horses. The high price of grain has made the feeding of horses an expensive proposition. Tractors are proving economical and time and labor saving.



When Velie Is Named Car Buyers Always Think of Quality

WHY? Because Velie cars have meant *exceptional* quality from the very beginning—exceptional performance, exceptionally low upkeep, exceptional appearance. Velie cars, with Continental Red Seal motor, Timken axles front and rear, long underslung springs, Velie lasting mirror finish—every specification of equally high merit, are not excelled by cars at any price. Today, when cars must yield more service than ever, Velie cars are more *desired* than ever.

Nine superb models—Touring Cars, Roadsters, Sedan, Coupe, Cabriolet, Town Car, Sport Model—give the dealer a car to meet every need. Whether for business or recreation, the family or the individual, there is a Velie for *every* use. Here is a complete line which gives you command of your entire market. If the Velie is not represented in your territory, write for our proposition.

VELIE MOTORS CORPORATION, 113 Velie Place, MOLINE, ILLINOIS
Builders of Automobiles, Motor Trucks and Tractors

Velie Biltwel Six

When Writing to Advertisers, Please Mention Motor Age

*Fewer Cars to Sell -
Sell Lalley-Light*

Lalley-Light will make you independent of the motor car shortage.

You can sell it to your old friends and customers—the farmers—as readily as you sold them automobiles.

Farmers want electricity from a reliable independent plant. Lalley-Light has been in actual farm use more than seven years.

Hundreds of automobile dealers are now handling Lalley-Light; and the Lalley-Light franchise is fast becoming more valuable than any automobile franchise.

Write at once or wire for details.

Lalley Electro-Lighting Corporation
1821 Mt. Elliott Avenue Detroit, Michigan

LALLEY-LIGHT

"Always runs and runs right"

When Writing to Advertisers, Please Mention Motor Age

STEPHENS

Salient Six

Balance of Strength

A PERFECTED over-head valve engine which burns ALL the gasoline, develops a full fifty-seven horsepower and yet carries this swift, graceful, even-riding car fourteen to eighteen miles on a gallon of gasoline. That is balance of strength.

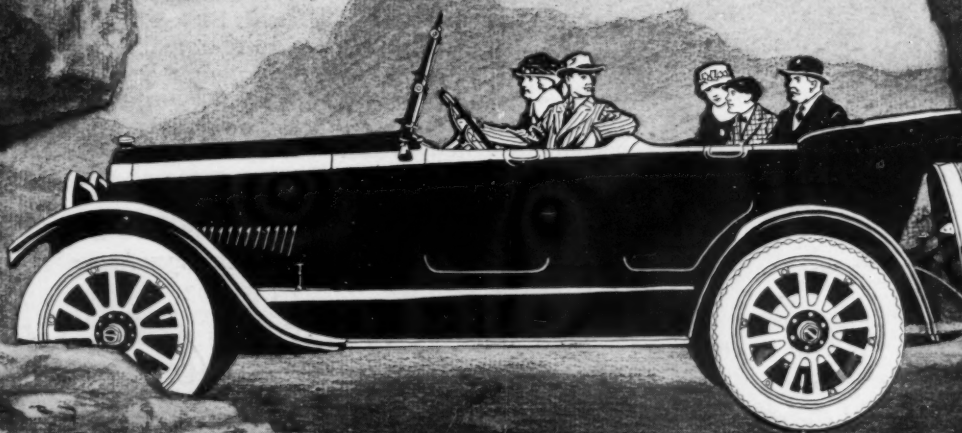
Every piece in chassis and body of such sturdiness that breakage is practically unheard of, yet with such scientific distribution of strength that this big car is of small weight—"light on its feet." That is balance of strength.

5 Models

- Three-Passenger Roadster
- Four-Passenger Touring
- Five-Passenger Touring
- Five-Passenger Victoria
- Five-Passenger Touring Sedan

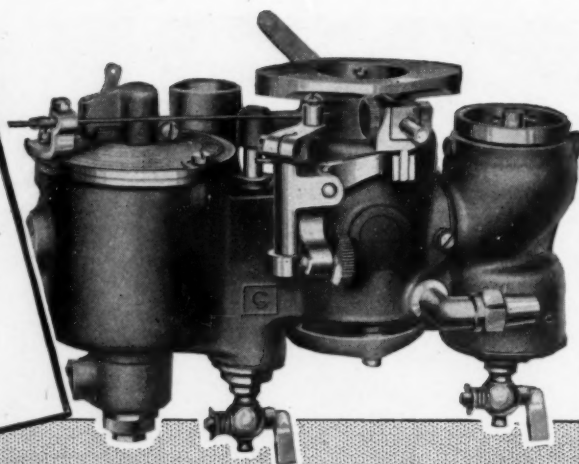
Stephens Motor Branch
of Moline Plow Co., Moline, Illinois

Factory: Freeport, Illinois





W.S.S.
WAR SAVINGS STAMPS
 ISSUED BY THE
UNITED STATES
GOVERNMENT



In Our Country's Service *Saving Is Serving*

A **RAYFIELD CARBURETOR** enables the owner to conserve from 20 to 50 per cent more gasoline than any other make. The gas you save will *drive the tanks "over there."* The money saved can be used to *buy War Savings Stamps "over here."*

RAYFIELD
 CARBURETORS

"THE WORLD'S BEST"

Rayfield Special for Ford Cars

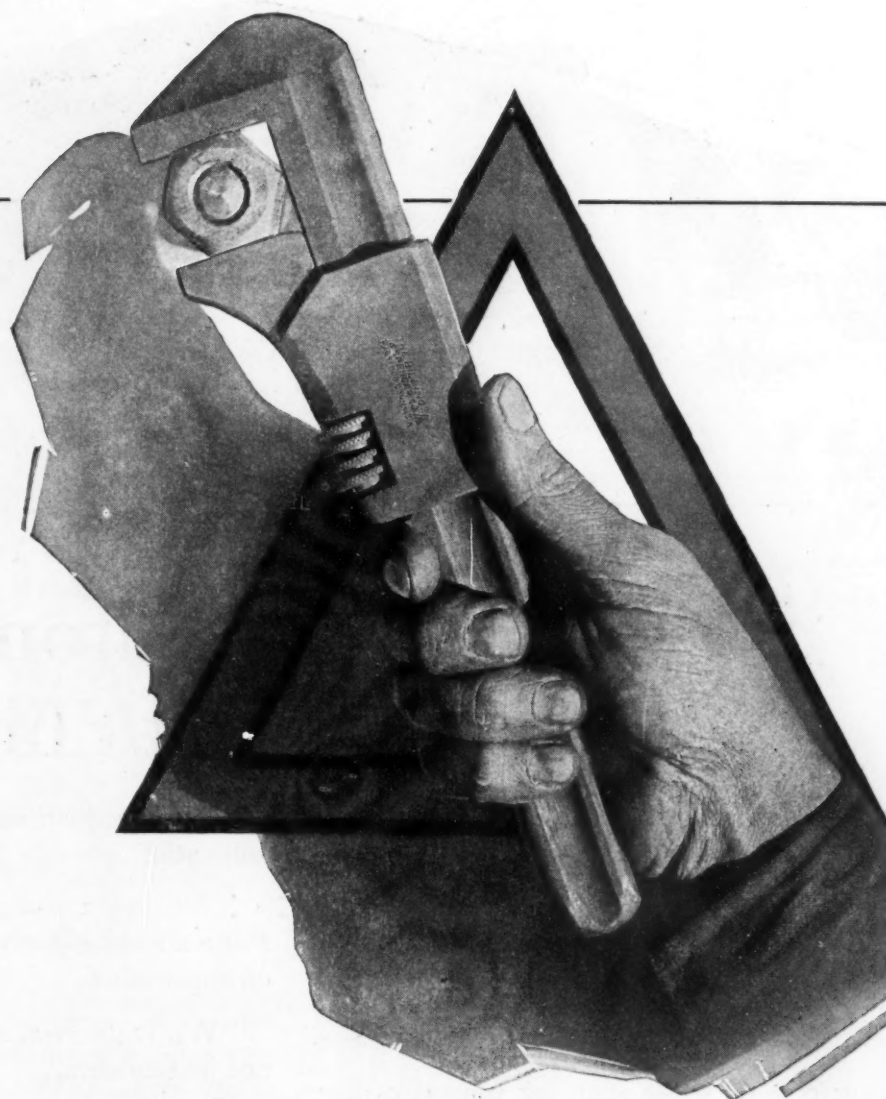
Thousands of Ford owners are buying the Rayfield Carburetor because it gives them an easier starting car, greater flexibility and more fuel economy. The Ford car owner gets better all around motor performance from a Rayfield Carburetor because it is especially designed to add economical efficiency to Ford cars.

The New Rayfield Thermostat

Thousands of cars are equipped with this new device. The Thermostat insures proper temperature for best motor performance under all weather conditions. Quickly installed as a permanent part of the circulating system, it makes *any automobile* and all year 'round car. Adapted for any make of motor. Write today.

*Rayfield Carburetors and Thermostats Are Sold by Dealers
 and Service Stations Everywhere*

Findeisen & Kropf Mfg. Co.
 21st and Rockwell Sts., Chicago



Look In Your Tool Kit

IF it holds Billings & Spencer Triangle B tools, your car is probably one of the leaders. Triangle B tools are made with a reputation of half a century for hard and constant service.

Automobile men know what this means. They know that the sudden emergency out on the road calls for the real thing in tools and nothing less.

Garage men thank their stars when a tool stands up under hard service. So your car deserves Triangle B.

Your hardware dealer carries the Triangle B line. Bring your car up to date today, with tools that say, "Rely on me."



This mark
says
"Rely on me"

**THE BILLINGS
& SPENCER CO. 
HARTFORD, CONN. U.S.A.**



"I Want You Automobile Dealers to Get' This"

"Carl Page and Irvine Fickling in New York, Jim Levy in Chicago, Tom Dunn of Pierce-Arrow fame in Pittsburgh and nearly a hundred other automobile merchants of like calibre in all parts of the country have enthusiastically taken on the Fulton Motor Truck.

"Any one of these men by reason of his experience, his prestige, his reputation and general standing could have handled practically any truck he wanted.

"*But they all chose the Fulton. Get that. They all chose the Fulton.*

"And they are all *making money*—and crowding us with a constant stream of repeat orders.

"Consequently we have been forced to greatly enlarge our factory—and to greatly increase production.

This step justifies a gradual increase in our sales staff.

"We want Fulton representatives of the Page-Fickling-Levy-Dunn type in every city of importance.

"We want *real motor car merchants*—not just dealers.

"Even if we are represented in your city send in your application. Territories often expand and have to be divided—or old contracts may be revised. At any rate it will do no harm to have your name on our files.

"Write me personally and I'll give your individual case my personal attention."

N. M. Fulton Melhuish
 President

Fulton Motor Truck Company
 Farmingdale, Long Island

Send for our booklet
 "Triple-Heated" Gas.

FULTON
MOTOR
TRUCKS
 FARMINGDALE, LONG ISLAND

When Writing to Advertisers, Please Mention Motor Age

**5000
MILES**

THE MIGHTY AMAZON

*"The Tire That's
Easy to Sell"*

To a few more discriminating dealers we are prepared to offer exclusive selling rights for Amazon, "The Tire That Is Doing Things."

The tire sells easy, and repeats; we pay for all the advertising over your name in your territory. Our present dealers tell us that our co-operation, methods, policies and treatment are the fairest, squarest and broadest they have ever known.

Amazons are made with both Non-Skid and Ribbed treads, and our line includes a red and a gray tube of unsurpassable merit.

Write for our proposition—it will pay you to "Get Acquainted with AMAZON."

THE AMAZON RUBBER COMPANY
AKRON OHIO
NEW YORK BRANCH
218 AMSTERDAM AVE

WARNS!

DOES NOT FRIGHTEN

Here it is

The new and beautiful Warning Signal
that is taking the country by storm

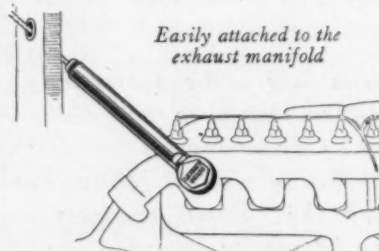
Liberty Siren

SINGS LIKE A MOCKING BIRD

The greatest success in years—every motorist wants one. It's the perfect warning signal—sings and trills like a bird—has a range of two octaves—plays 1000 different tone combinations—adds class to any car—conforms with all city ordinances.

Positively Guaranteed

The Liberty Siren saves the battery—costs nothing to operate—controlled from the dash or steering wheel—self-cleaning and indestructible. It is handsomely nickel-plated—and comes boxed with full instructions for installation—price \$3.50 complete.



*Easily attached to the
exhaust manifold*

*Fits all cars—uses exhaust gas—costs
nothing to operate*

Dealers

Ask your jobber. If he cannot supply you, write us direct, giving your jobber's name and address.

Jobbers

The Liberty Siren has "gone over the top." Scores of orders are coming in daily—get ready for the demand in your territory.

\$3.50
Complete

LIBERTY ACCESSORIES CORP.

1134 Chestnut Street

ST. LOUIS, U.S.A.

When Writing to Advertisers, Please Mention Motor Age

Do You Appreciate the Magnitude of the Maxwell Motor Car Company

More and more, automobile distributors are considering the future, its perils and its possibilities.

Which of the concerns now in business will be able to weather the storms—meet the severe demands of war and weather the gale of competition that will follow?

You, and every other successful merchandiser of motor cars and trucks, are trying to determine which will endure—which will pass.

For you have come to the conclusion that changes are wasteful and expensive.

You want to tie to one line for keeps.

And your experience teaches you that such a concern must be strongly fortified financially and splendidly equipped to manufacture a full line of passenger cars and trucks—and eventually also farm tractors.

Dealers are apprehensive just now—and not without reason—that we may be unable, because of the great amount of Government work we have taken on, to supply them enough motor cars and trucks to keep them in business.

The best answer to all such is to show, as we do on the following seven pages, reproductions of the various Maxwell factories.

We have a lot of Government work—every Maxwell plant is doing its full part. We are doing all Uncle Sam has asked us to do—willing and eager to do as much more as he may desire.

But, while it is now certain that our motor car production will be seriously curtailed, still we hope to be able to take care of distributors and dealers as well as any other concern in the business.

Reduced to the size of a page, a 20-acre plant looks small.

Study the pictures however—you will have a better idea of the magnitude of this concern—a clearer conception of our tremendous manufacturing facilities.

Maxwell Motor Cars and Trucks are made in their entirety in the Maxwell plants.

We are genuine manufacturers—not assemblers.

We can guarantee the product, because, making every part ourselves, we know that every part is good.

We make a complete line—keep abreast of the times. And we like to do business year after year with the same folk.

For a permanent connection and a profitable business, you'll find this the most likely and desirable.

MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Maxwell Factory Facilities

Plant No. 1—Detroit

This plant, familiarly known as the Oakland plant, has an area of 650,592 square feet.

Here Maxwell cars are assembled.

There is also a large machine shop in which are manufactured many parts of the motor. Final assembly and chassis testing are also done here.

At this place also are the Maxwell Laboratories, the equipment of which is second to none in the world.

With us, a metallurgist laboratory is not merely a plaything or a place through which to show visitors, but it is one of the vital essentials in the manufacture of Maxwell motor cars and trucks.

We do not depend for the quality of our materials on tests made in the steel mills, but every batch of steel or other metal received is rigidly tested in our own laboratories.

No chance or guess work enters into the design or construction of the Maxwell product.

When a part is designed, the specifications by which that part is to be made and the various heat treating processes through which that material is to pass, are determined by the most exhaustive experiments.

Ordinary steels find no place in the Maxwell product.

Almost every major part is made of a different alloy or passes through a different form of treatment to produce in it those qualities requisite to perform its own particular function.

The long life and low operation cost of Maxwell motor cars is determined even more in the laboratory than in the factory.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Chalmers Plant

Plant No. 2—Chalmers Plant

As everybody in the automobile business knows, the Chalmers factory and product, some months ago, came under the control of the Maxwell executives and organization.

The plant shown herein is familiar to all automobile dealers and manufacturers as the famous Chalmers plant of Detroit.

This factory has a floor space of 884,271 square feet, and here all parts of the Chalmers automobile are made, the car itself assembled and tested.

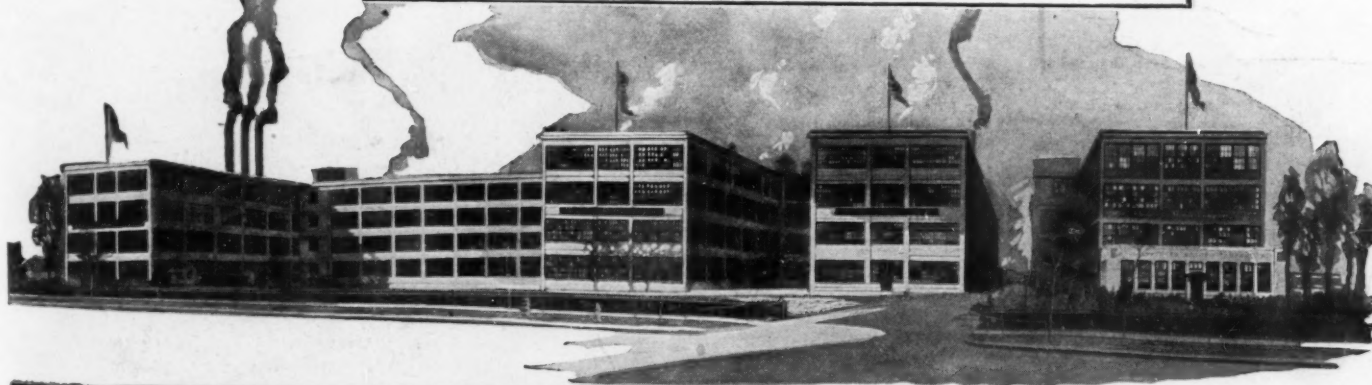
This is one of the most complete and one of the best equipped plants in the entire automobile industry, and the quality of the Chalmers product itself is the best evidence of the work done here.

In all fundamentals of design we found, when we took it over, that the Chalmers was a great automobile. It only needed a few refinements of details, a little closer attention to inspection, to become one of the really great motor cars.

The sales records are the best testimonial to its popularity and that, in turn, to its quality.

As in all the other Maxwell factories shown herein, a large amount of Government work is being done at this plant which necessarily called for reduction in our schedules for the coming year, but we hope to be able to continue manufacturing steadily although on a smaller scale.

Owing to the fact that this plant was nearer the center of the city and more accessible to distributors and dealers, the executive and sales offices of the Maxwell Motor Company are located here.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Canadian Plant

Located at Windsor, Ontario, directly across the Detroit River from Detroit, is the plant where Maxwell motor cars are made for Canada and other British possessions.

This plant, although not quite so large as the American factories, is just as complete in equipment as the others.

For example, a battery of dynamometers test the motors for power.

Your Canadian buyer is particular as is indicated by the fact that only a few of all American made cars enjoy any considerable business there.

Maxwell does the second largest business in Canada, as nearly as we can ascertain, the first being—well not exactly in the Maxwell class.

Maxwell popularity in Canada is due to the fact that it is designed along accepted standards and manufactured with the utmost precision and care.

And that brings us to a point we always like to emphasize in speaking of the Maxwell product.

We have never attempted to invent anything radically new, nor to try out experiments on our customers.

From the very first the policy of the Maxwell Motor Company has been to adhere to standardized units and, instead of trying to develop something radically new, concentrate all our thought to making those standard units better.

There is nothing new in a Maxwell motor car. From motor through the clutch, transmission, axles, steering gear and all other units, it is designed and built along accepted lines and in detail, as well as in the whole, represents the best there is of standard products.



MAXWELL MOTOR COMPANY INC.
DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Dayton Plant No. 1

In this plant all Maxwell bodies are built.

To those who have been in the automobile industry a long time, that statement carries much of significance.

All old time dealers will recall the Stoddard Dayton cars with their wonderfully well built bodies, and when we say that those bodies were all built in this plant, you will readily understand that not only is the equipment here of the best, but the workmen the most skilled in bodycraft.

With a floor area of 282,425 square feet, we have ample room for the making of sheet metal stampings, turning out mill work and doing the finishing, upholstering and painting.

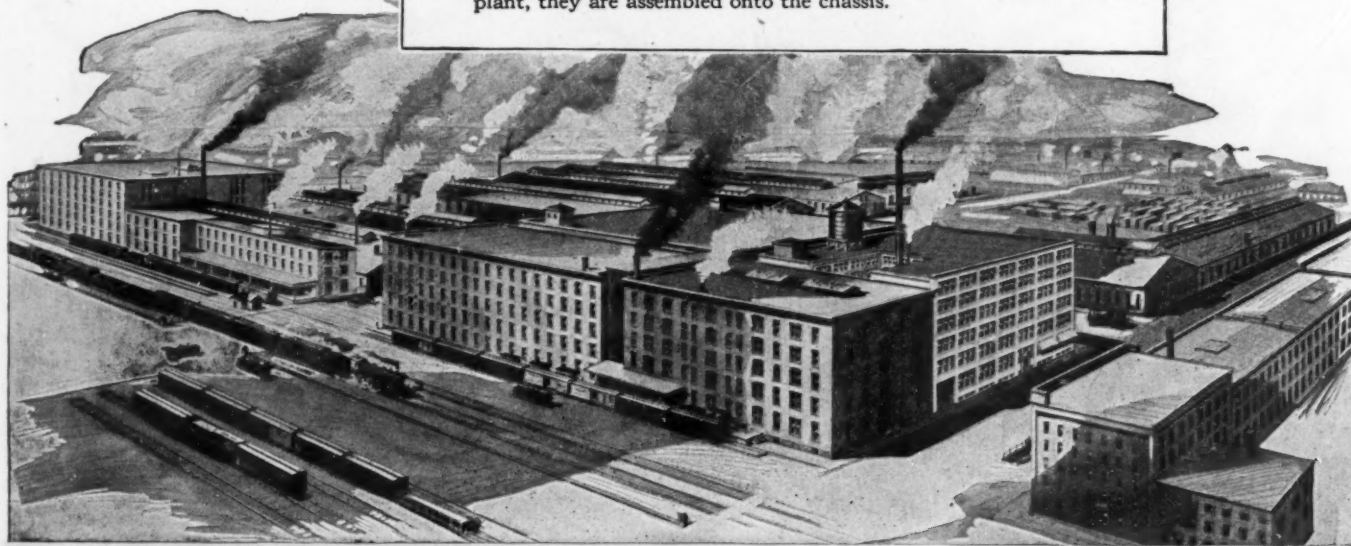
If we were permitted to tell the amount of work we are doing here on aircraft construction, you would have a more comprehensive idea of Uncle Sam's plans and of the present scale of operations in that direction.

It just happened that automobile body builders were splendidly equipped in experience, in machines and with workmen, to turn out the wood and fabric parts of airplanes.

Always anxious to do its part, the Maxwell Motor Company was one of the first to offer as much of its facilities as Uncle Sam might require for this purpose.

The quality of Maxwell bodies—and they are noted for their staunchness and for the durability of finish—is due to the fact that we make them right here in our own plant and under our own supervision and inspection.

From here they are shipped to Detroit where, at the Oakland plant, they are assembled onto the chassis.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Dayton Plant No. 2

For convenience sake, we call this plant No. 2 but, as a matter of fact, there are crowded on this space two distinct plants which we call, within our own organization, "Dayton Plants Nos. 2 and 3."

There is a plant No. 4 also a short distance from this one of which, however, we have no photograph at this time.

The floor area of the latter is 45,000 square feet.

Here is one of the best foundries in the United States.

Cylinder and piston castings call for the best work of the foundryman, and until we made our own pistons we could not get the quality we desired.

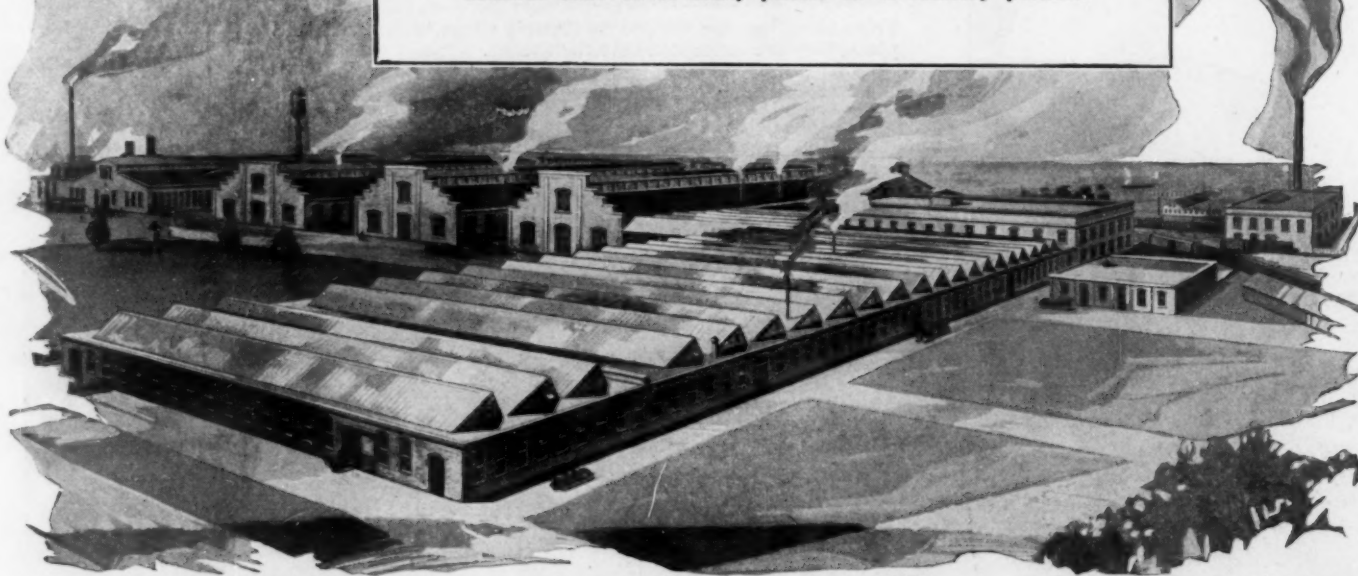
So accurate is the work in this plant, our discards, due to imperfections in the casting, constitute a very small percentage of the total.

This in itself is a guarantee of quality to the buyer.

Here also are great batteries of heat treating furnaces.

All castings are annealed before machining to relieve them of stresses and to obviate the possibility of cylinder or piston casting distorting under heat in operation.

Every plan that science could devise; and every precaution that experience could dictate, is exercised here to the end that every Maxwell shall be as nearly perfect as is humanly possible.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Briscoe Plant

Several years now since the Briscoe Motor Company occupied this plant, but it is still familiarly known as such in the trade.

It is located on Woodward Avenue, Detroit, just two blocks off Grand Boulevard, and while not as large as some of the others, a tremendous amount of work is turned out here.

We have said that every part of the Maxwell car is manufactured in our own plants.

Many concerns who make that statement resort to a mental reservation when it comes to speaking of fenders, radiators, hoods, gas tanks, etc.

In our case this is not necessary because those important parts are all made in the "Briscoe Plant."

This was one of the first plants in the world to make stamped steel parts. From time to time the equipment has been improved as the science of steel stamping has developed until today there is no plant in the industry that turns out finer work or can attempt more difficult feats of stamping than are possible in this Maxwell factory.

Of course this plant does its quota of Government work too, although for obvious reasons we are unable to state here precisely what that work is.

Suffice it to say that the ingenuity of the Maxwell organization, the skill of Maxwell workmen and the precision of Maxwell machines have been brought into play to accomplish things that only a short time ago were considered impossible.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age

Another Maxwell Factory

Newcastle Plant

Situated in the little town of Newcastle, Indiana, where we are able to draw upon the great farm districts for young men and train them into expert machinists, our facilities for turning out good work are exceptional.

This is one of the largest of the Maxwell plants, having a floor area of nearly half a million square feet.

Because of its distance from Detroit, we maintain here, as well as at that point, a large laboratory for analytical work and the testing of metals.

Machines for determining the static and dynamic qualities of steel, torsional tests, etc., are here employed to determine the quality of every part in order that we may back it with the Maxwell guarantee.

The drop forging equipment at this plant is one of the finest in the world—and one of the biggest.

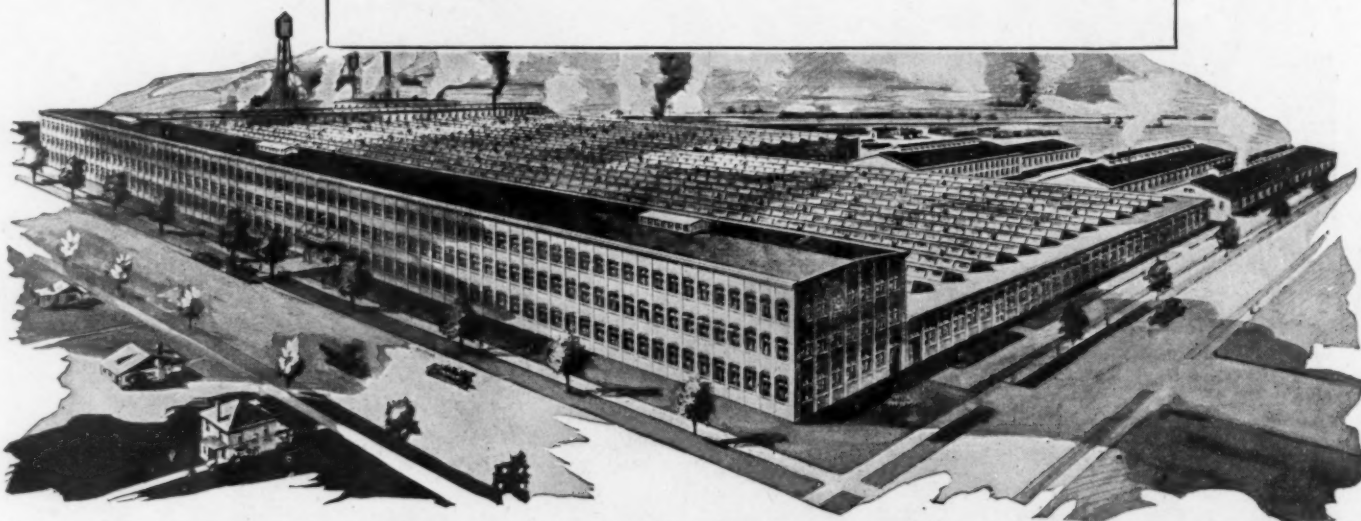
Here all drop forgings for the Maxwell car are made.

Also a very large percentage of automatically machined parts for transmission, axles, steering gear and other units are made in the Newcastle plant.

Because of its central location, we also handle all of the Maxwell service from this point.

Fully 50% of Maxwell owners can be furnished with replacement parts within 24 hours, while 50% of that, in turn, are within the 12 hour radius.

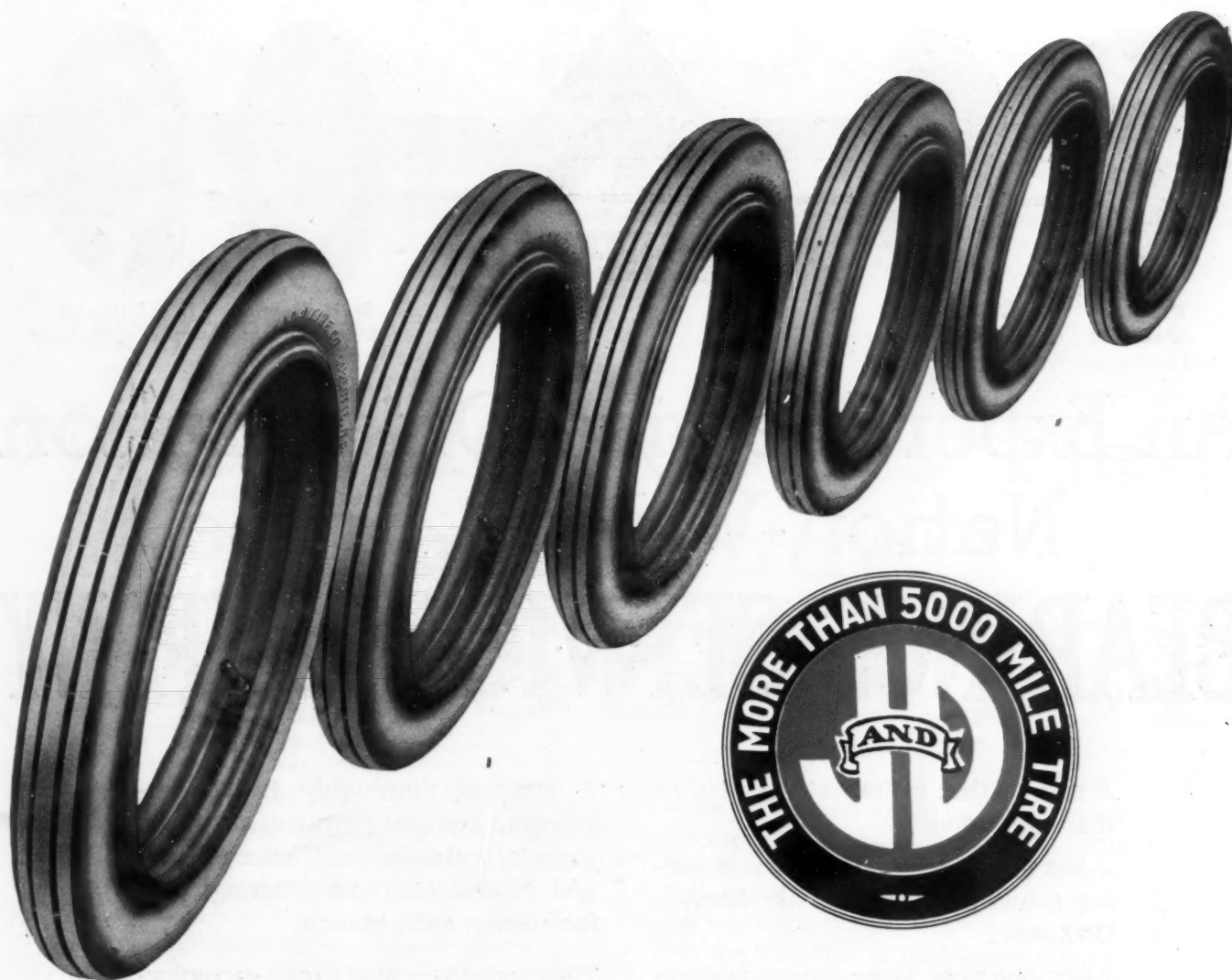
We are rather proud of our service system and consider it is second to none.



MAXWELL MOTOR COMPANY INC.

DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age



Every J & D Tire Is Like every other J & D Tire—Better than its Guarantee

No hand-made article is improved under quantity production conditions, whether it be a tire or a Swiss watch.

J & D Tires are turned out in moderate quantities—just as fast as painstaking hand assembling can produce them. And no faster.

No J & D Tire is allowed to leave the factory without undergoing a final rigid inspection by *experts who do nothing else*. Under this close scrutiny every tire must make a flawless showing or be rejected.

Add to this a thorough standardization of workmanship, and you have the reason for the exceptional *uniformity* of J & D Tire Service. You have the reason for the great mileage *in excess* of 5,000, enjoyed by J & D users.

Dealers: A J & D agency is profitable. We give you a generous margin, and your territory is fully protected. Write for details.

J & D TIRE COMPANY, Charlotte, N. C.

New York Offices: 1834 Broadway

When Writing to Advertisers, Please Mention Motor Age



An Expert Service Organization Nation-Wide in Scope BEARINGS SERVICE COMPANY

A service that is "expert" in all that the word implies—

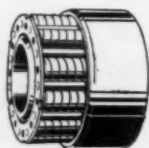
—has been responsible for the amazing growth of the Bearings Service Company.

After one year this concern is operating twenty-two branches in the leading motor car centers and has more than 500 distributors.

A force of thoroughly trained engineers, complete manufacturing records, and a stock of Timken, Hyatt and New Departure Bearings are facilities at each branch.

This concern is able to supply motorists with new bearings for repairs and replacements without any inconvenience to the motorist.

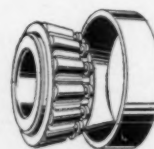
The Bearings Service Company is the national authorized service representative for the manufacturers of Timken, Hyatt and New Departure Bearings.



Hyatt



New Departure



Timken

Branch Managers



When Writing to Advertisers, Please Mention Motor Age



C. T. Barbour
Purchasing Agent



L. V. Cady
Auditor



J. W. Owen
Traffic Manager



L. M. Baker
Manager Rim Dept.

Now Enlarges its Field to Include RIM SERVICE

This nation-wide perfectly working service organization is now offering to motorists, dealers and garagemen a complete service on RIMS.

No matter what make or model car—if it is equipped with Detroit, Baker, Perlman or any similar type of rims—the owner can now get new rims in the time it takes to change a tire.

This is the first time that a country-

wide service on rims has ever been offered to the motoring public and those who have had occasion to become acquainted with the class of service rendered by this company will realize that it is to their advantage to avail themselves of this new Rim Service.

In every important motor car center there is "Rim Service" just around the corner from you.

*Twenty-two
Branches*

*General Offices
Detroit*



Branch Managers



N. B. Keller
New Orleans



R. S. Tuttle
New York



W. C. L. Hodgson
Omaha



L. H. Ward
Philadelphia



C. M. Fox
Pittsburgh



R. H. Cross
Portland, Ore.



G. G. Ballagh
Rochester



L. A. Johnson
San Francisco



C. R. Jones
St. Louis



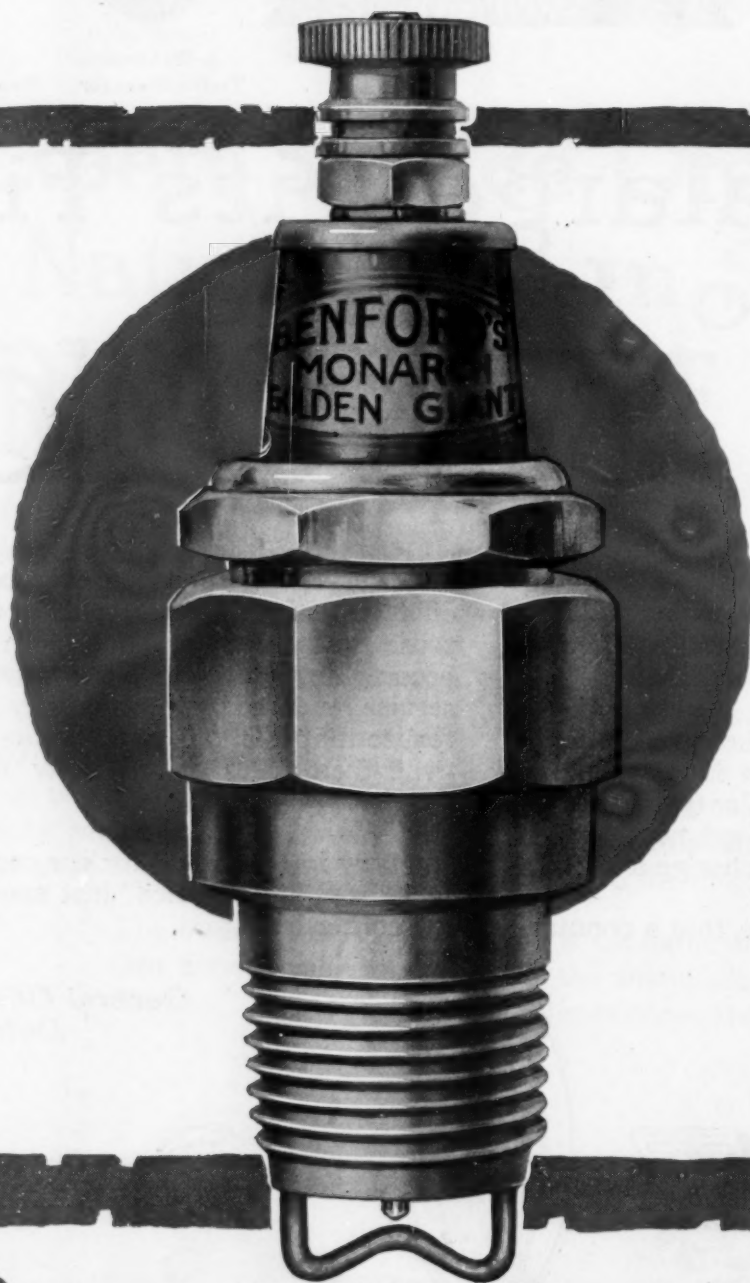
R. P. Gosslee
Seattle



M. J. Shortt
Toronto

When Writing to Advertisers, Please Mention Motor Age

A Business



CAR owners come to your store oftener to buy a spark plug than any other item in your stock. The spark plug is the leader of the line.

How are you handling this trade? Surely this is no year for cut prices and poor goods.

Car owners who need spark plugs will gladly pay the price necessary to secure good spark-plug service. That's what they are buying—SERVICE.

Do you always sell them a plug that gives them service? Or do you make the mistake of selling them "any old plug"?

Build Your Business with the Golden Giant

Golden Giants will always give—unfailingly—the spark-plug service an owner needs. There is never any reason for dissatisfaction. Made of the best—only the best—materials, in the most careful way, it cannot go wrong. The car owner can take it apart and clean it easily—and if he does so, this plug will almost have life everlasting.

And, Mr. Dealer—

Golden Giants bring the full list price always

Send your jobber an order for the 50-plug Golden Giant Assortment, and get our sales-magnetizing Display Cabinet.

BENFORD'S

s Builder

SUCCESSFUL merchants have built their businesses on the basis of first-class merchandise, finely finished and properly priced.

The Golden Giant makes good on each of these specifications in a supreme manner.

It is first class

—indisputably. Examine one yourself and get the proof. If a finer, more efficient spark plug could be made, we'd make it.

It is finely finished

—beautifully finished. Shell plated with pure gold, nicked bushing, blue insulator—every Golden Giant you display is an irresistible sales-puller. It has the dignified beauty that can only be associated with strength and rugged construction.

It is properly priced

The Golden Giant price is moderate when the quality of the plug is considered. There's no profiteering in the Benford plant. We could easily ask for and get more. But we were in business before the war started—and we'll be in business when the war ends. We are willing to take our profits over a series of years, and shall not add anything to the economic burden of the industry.

Combine these factors of quality, finish and price with the obvious fact that intelligent motorists gladly come back to the store which sells only merchandise that serves them well, and you will admit that our leading statement is fully warranted by the facts—

**The Golden Giant is
a Business Builder**

Benford Mfg. Co., Mt. Vernon, N.Y.

GOLDEN GIANT

HERCULES
SPARK PLUGS
"Strictly A Quality Product"
Eclipse Manufacturing Co.
Indianapolis Indiana U.S.A.



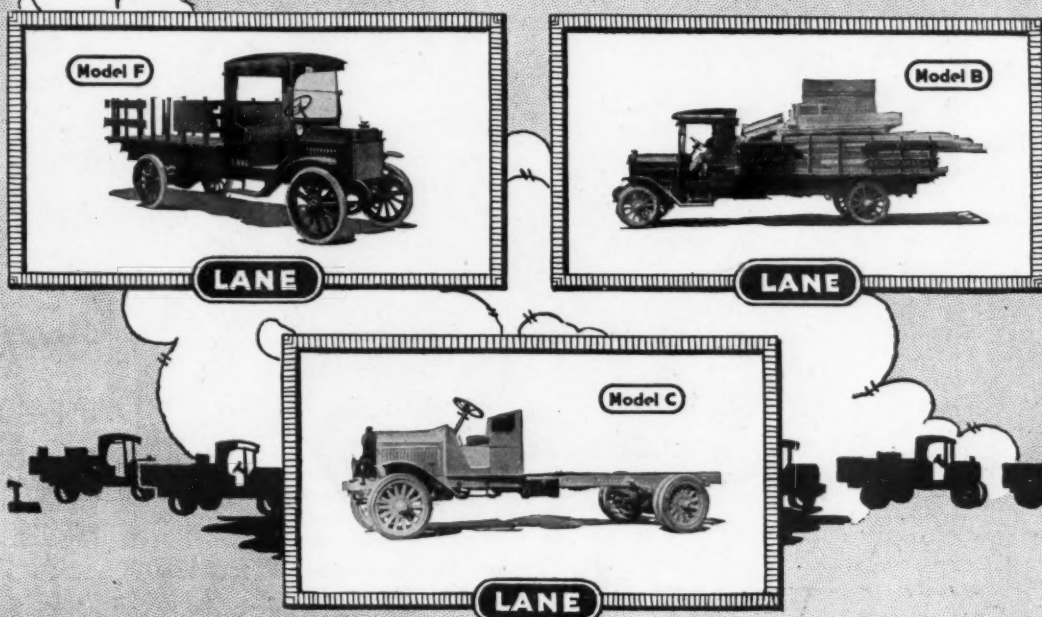
A detailed illustration of Hercules, a muscular man with a lion's head, fighting a large dragon. Hercules is holding a sword and a shield, and the dragon is breathing fire. A woman is also present, looking on. The scene is set in a dark, rocky environment.



A detailed illustration of a Hercules Spark Plug. The plug is shown in a vertical orientation, with the top electrode and the bottom electrode visible. The central body of the plug features a circular logo with the word "HERCULES" and a large "H". Below the logo, the text "PAT 2-16-15" is visible. The plug is shown in a detailed, mechanical style.

Second Labor

THESE TRUCKS



Will Put Ginger in Your Business

Today there is probably not a single automobile dealer in the United States able to obtain all the pleasure cars he can sell, and that condition is as certain to maintain until the end of the war, as that night follows the day.

But, on the other hand, owing to the emergencies of the titanic transportation problem, to which the modern truck has proven a veritable Godsend, it is equally certain, that the government will interfere as little as possible with truck production.

And of all trucks there are none better than the LANE, for either dealer or customer.

In the first place LANE trucks are superior trucks—the best trucks in their capacity class ever made at any price: built on honor from the ground up and complete in every detail of construction and equipment, including standard electric lighting and

starting systems, Continental motors, Timken axles, Goodrich DeLuxe tires, etc.

That's why LANE trucks sell easily in the face of any competition, and, once sold—stay sold, and sell others.

Then the LANE agency agreement carries an exceptionally liberal dealer's discount. ¶ Besides, it's plain, straightforward and easy to comply with.

You will find it greatly to your own advantage to tie up the LANE truck line for your territory.

¶ Act today before your

competitor slides in ahead of you.

Send in the coupon now. ¶ It will be a pleasure to forward you full details of our sales proposition; and, the super-merit of the LANE truck specifications will prove a genuine surprise to you.

LANE

THE LANE MOTOR TRUCK COMPANY

Kalamazoo, Michigan, U. S. A.

THIS COUPON FOR YOUR CONVENIENCE
 The Lane Motor Truck Co. Dept. J Kalamazoo, Mich.
 Please send me complete specifications of the Lane trucks and Dealer's proposition.
 Name _____
 Address _____



Locate your little power leaks

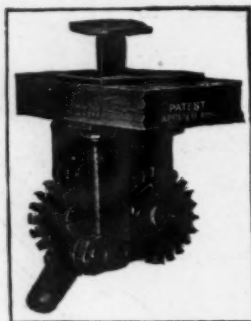
Do you really know what your motor is doing? Can you tell the minute a cylinder is laying down on the job? Or do you wait until it is skipping badly?

The G-P Muffler Cut-Out shows up clearly just what your engine is doing. It enables you to save power, and power is costly. It helps to keep your engine running sweetly, and adds a new pleasure to driving. It shows up the little losses that take the edge off power.

Note that it is made simple and strong. The G-P Muffler Cut-Out opens at an angle that permits the freest escape of gas. There is no back-pressure.

Carbon will not accumulate. Made in two parts to be readily opened and inspected. Gives complete relief to motor. It will tell you more about your engine in a minute than you can learn from a month of ordinary driving.

The G-P Muffler Cut-Out and G-P PEDAL



The G-P Pedal is made entirely of steel, and is strong enough to operate any cut-out spring. The geared compound leverage makes it easy to operate.

Compounding of leverage and geared parts allows installation in minimum space. Its installation requires but one small hole

drilled in floor board. The locking device is on the bottom plate, so the pedal can be fastened to a steel or wood floor board of any thickness without altering its throw.

By releasing one screw the G-P Pedal can be changed to lift or pull in any direction. Operates any cut-out easily.



Sales Department

EDWARD A. CASSIDY COMPANY, Inc.

Madison Ave. at 40th Street, New York City

Manufacturers: The G. Piel Company, Inc., Long Island City, New York



Why the MOON sells

The unusual beauty of the Moon gains first, the public's recognition. Men and women everywhere are impressed by the graceful, sweeping lines of this car. They instantly decide that it must be high-priced. They want a Six with all its advantages, but it must be one that meets their price requirements. The popular price of the Moon Six commands interest.

MOON CARS

Six-66

Seven Passenger Touring
and Club Roadster

\$1985

f. o. b. St. Louis

Six-36

Five Passenger Touring
Full Equipped

\$1295

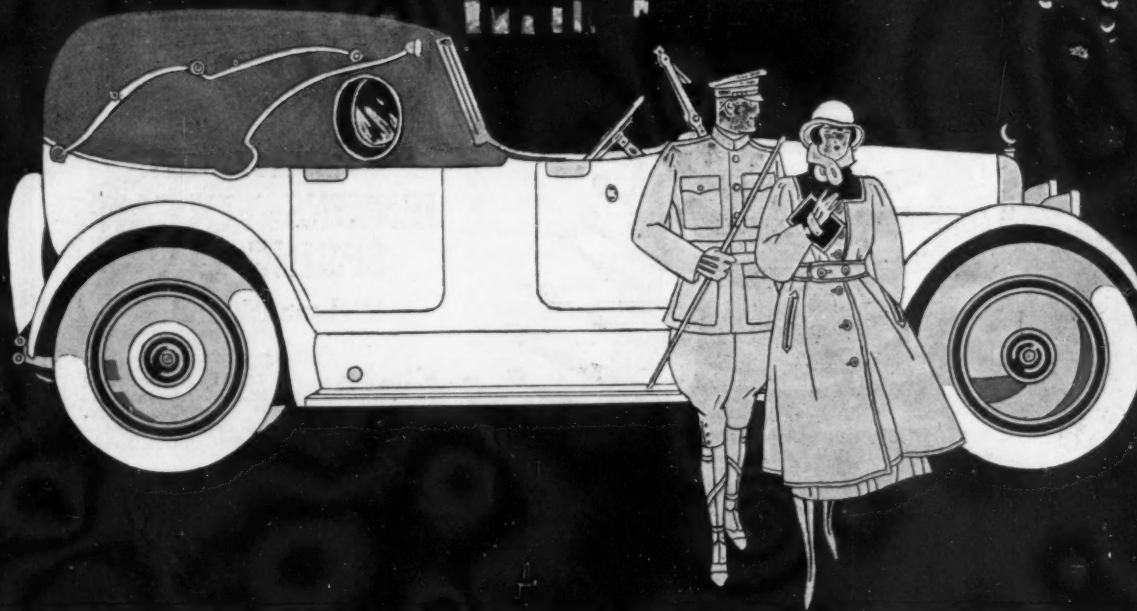
f. o. b. St. Louis

And now, when the Moon is inspected critically, both externally and internally, with an eye to buying, the buyer's interest turns to enthusiasm. He finds in the Moon Units, —mechanical perfection, assurance of faithful performance, power to spare,—in fact, an answer to every requirement.

Because of the central location of our factory outside the congested freight district, we can offer you prompt deliveries. Many dealers come to St. Louis, purchase their cars, and drive them home.

Some choice territory still open to aggressive dealers

MOON MOTOR CAR CO.
St. Louis, U. S. A.



When Writing to Advertisers, Please Mention Motor Age

That's the message now being carried to millions of car-owners through the pages of National publications such as:

Saturday Evening Post,
 Colliers Weekly,
 Leslies Weekly,
 Automobile Blue Book
 and all Trade Papers.

When Your Spring Breaks Put On

VULCAN

QUALITY

VULCAN

The Replacement Spring

To Dealers: You need this display rack full of quick-selling, replacement Vulcan Springs—and you need it now.

If you are one of the 3,000 live dealers who already have it, see that your stock is complete. Order what is short.

Here is something you want—

Real Profit With Small Investment

Our display rack is FREE to you with an order for one dozen or more assorted Vulcan Springs. Owners want service. They are already sold on Vulcan Springs. Now it's up to you to cash in on this advertising and good reputation and pocket the big profit that is yours. When the car owner drives up and asks you to "put on Vulcan"—be prepared. He wants **service**—real service. Give it to him. You need this kind of profit that requires no growing investment. Vulcan Springs move fast. Wake up!

Write Today for Our
Spring Rack Proposition.

**JENKINS VULCAN
SPRING CO.**

Richmond, Ind.

Factory Branches

St. Louis, Missouri 1402 Chestnut Street
 Minneapolis, Minn. 1024 Hennepin Ave.
 Dallas, Texas 209 South Houston St.
 Reading, Pa. 538 Franklin Street
 Sumter, S. C. 29 Caldwell Street

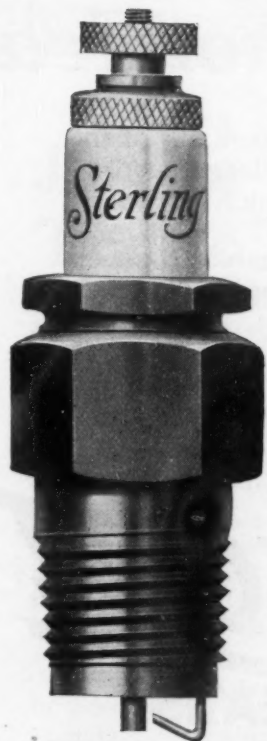


When Writing to Advertisers, Please Mention Motor Age



The Dealer Knows!

When the dealer recommends Sterling Spark Plugs he knows he is doing you a service because he knows the value of Sterling Plugs and knows he can personally guarantee their performance. That is worth while.



A size and style
for every car

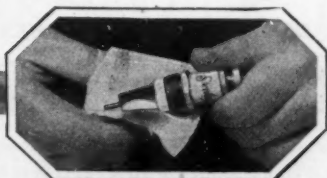
Sterling Spark Plugs

If your car was not originally equipped with separable spark plugs you will replace them eventually. Then put in Sterlings and you will appreciate their distinct advantages. When carbon accumulates wipe the porcelains with a cloth or waste and the plugs will give service equal to new ones. Separated, the porcelains are bare—from top to bottom. No doubt about their being *positively* clean. Sterling Plugs are sold by progressive garages and supply dealers.

LOCKWOOD-ASH MOTOR CO.

1956 Main Street

Jackson, Mich.



(42)

When Writing to Advertisers, Please Mention Motor Age



Broad Street, Philadelphia

Dependable, Yet Economical

Power of endurance that comes only from the most skilled handling of the finest materials is shown to a remarkable degree in Mason mileage records. Only perfect balance of toughness and resiliency can develop such durability.

Yet Mason Tires are popular priced—initial costs are reasonable; upkeep costs remarkably low. Motorists appreciate Mason Tires in these days when every dollar is called on for double duty.

The motorist who rides with Mason Ribbed Treads on the front wheels, and Mason Lattice Treads on the rear, is sure to have his speedometer prove that Mason Means More Mileage.

The Mason dealer policy is mighty popular with dealers. It insures good profits and steady sales. Drop a line to the factory for the details of the plan.

**The
MASON TIRE & RUBBER CO.**

FACTORY AND HOME OFFICES: KENT, OHIO (Akron Suburb)

MASON

**MEANS
MORE MILEAGE**

DISTRIBUTING BRANCHES:

Cleveland
1846 Euclid Avenue

Chicago
2120 Michigan Avenue

New York
28 W. 63d Street


Kansas City
1732 Grand Avenue

Buffalo
834 Main Street

Atlanta
21 Houston Street

Akron, O.
34 W. Market Street

When Writing to Advertisers, Please Mention Motor Age




Traffic Truck

4000 LBS. CAPACITY

\$1,095

THE LOWEST PRICED 4000 LB. CAPACITY TRUCK IN THE WORLD



Just as we anticipated, the Traffic Truck, 4000 lb. capacity, \$1095

is forging ahead with astounding strides, easily leading as the one big truck proposition of the day, completely dominating all competition.

We are after dealers; but the unusual truck value presented in the "Traffic" has reversed the usual situation; dealers are now after us in such numbers that they are keeping our entire directing force as busy and alert as men in a front line trench.

Sales territory is going rapidly—contracts are being closed daily with successful, aggressive dealers everywhere.

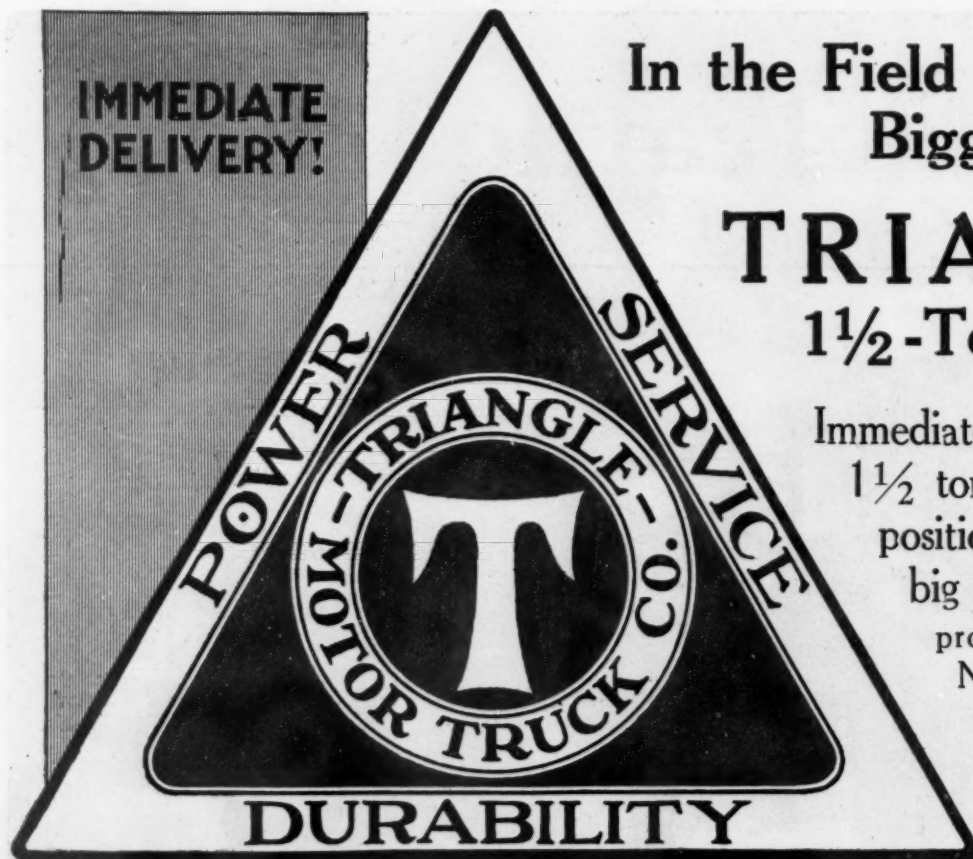
The qualifications and requirements we demand from dealers are high, and in completing our national selling organization, we want only such representatives who will consider the opportunity offered by the Traffic worthy of their presence at our plant in St. Louis. We want those who handle the Traffic to see it produced and demonstrated and be convinced that it is without question the greatest truck proposition in the world.

We can assure immediate delivery

In view of the fact that much territory has already been closed—wire and find out whether or not your territory is open—then come to St. Louis.

TRAFFIC MOTOR TRUCK CORPORATION
3807-19 Laclede Ave. ST. LOUIS, MO.

SOME TRAFFIC FEATURES: Weight—3,300 lbs.; Gray Motor, 4-cylinder valve-in-head, 35 h.p. Covert Transmission; Multiple-disc Clutch; Kingston Magneto; Cellular type Radiator; Drop forged Front Axle with Timken roller bearings; Russell Rear Axle, internal gear, roller bearings; Semi-elliptic front and rear Springs; 6-inch U-channel frame; Standard Fisk Tires; 133-inch Wheelbase; 122-inch length of frame behind driver's seat; Oil cup lubricating system—and many other features for perfect performance.



**IMMEDIATE
DELIVERY!**

In the Field of
Biggest Demand

TRIANGLE

1½-Ton Model

Immediate deliveries on this 1½ ton model put you in position to close with a big percentage of truck prospects in any locality. No delay. We have the trucks. The demand is greater than it has ever been—and it is growing. The market is wide-open.

Establish yourself now with the 1½ ton Triangle as a dealer in automotive transportation—the fastest developing branch of the motor car industry. Eventually you will handle the complete Triangle Line of 1½, 2½, 3½ and 5-ton models. Deliveries on our new 2½ model begin October 1st.

Now is your opportunity—today. Wire, or write at once for complete information and unusually interesting dealers' proposition.

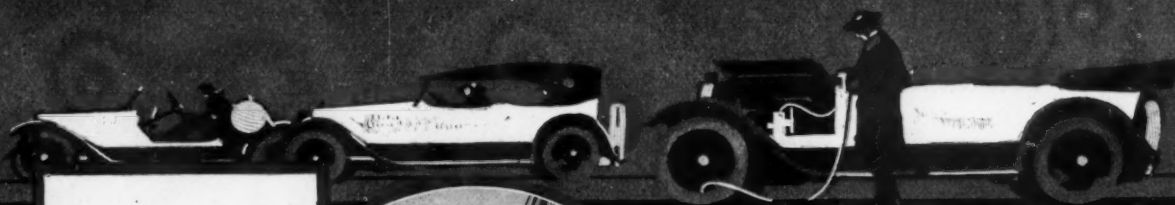
TRIANGLE MOTOR TRUCK CO.
ST. JOHNS MICHIGAN

SPECIFICATIONS

Waukesha Motor, Eisemann Magneto, Stromberg Carburetor, Fuller Transmission, Universal Drive Shaft, Celfor Internal Gear, Rear Axle, Torben-son Front Axle, Detroit Bronze-Bushed Springs, Gemmer Steering Gear.
Wheelbase, 144 in.—Turning radius, 23 ft. 6 in.—Tread, 56 in.—Clearance, front 9½ in., rear 12¼ in.—Tires, front 34x3½, rear 34x6.



When Writing to Advertisers, Please Mention Motor Age



**Regular
Equipment
With**

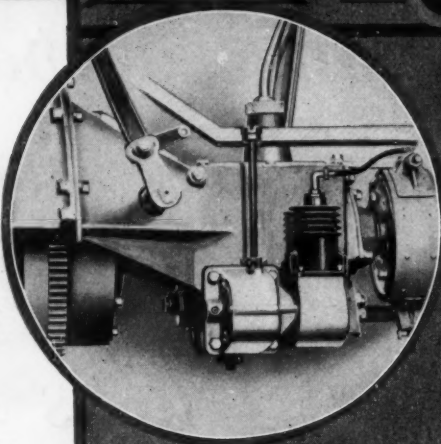
ANDERSON
CADILLAC
CASE
COLE
CUNNINGHAM
DANIELS
DRUMMOND
FIAT
FRANKLIN
HAL
HAYNES
KING
McFARLAN
MARMON
MOLINE-KNIGHT
MURRAY
NATIONAL
OVERLAND 89-6
OWEN MAGNETIC
PAIGE
PEERLESS
SIMPLEX
STANDARD
STEPHENS
TEMPLAR
WINTON
WILLYS-KNIGHT
88-4 88-8

*"These cars are
fully equipped."*

For Every Car
on This List we
have a Kellogg
Pump that fits
like Standard
Equipment.

BUICK
CHANDLER
CHEVROLET
DODGE
FORD
HUDSON
NASH
OAKLAND
OLDSMOBILE
OVERLAND
REO

*Mention make and
model when order-
ing.*



**One Thing You
Don't Have To
Worry About**

IN selecting your car for the season there is one feature that has been settled for you—in advance. No matter what kind of a car you buy—if it be fully equipped—it will carry a Kellogg Engine-Driven Tire Pump.

The high standards of design and construction, so prominent in this engine-driven pump, are equally adhered to in all Kellogg Outfits. The name KELLOGG is your guarantee of perfect, oil-free, air service.

KELLOGG MANUFACTURING CO.

Rochester, New York

KELLOGG
Engine Driven
Tire Pump

*The telephone company
has just printed a list of
men who are going to buy
Maxwell trucks*

Open the directory and pick out the "butchers and bakers and candle-stick-makers"—get the Maxwell truck agency; bring 'em 'round for a "once-over"—have your order blank handy—say "sign here" and begin to figure your excess profits tax.

Here's a truck with the guts and go of \$5000 kinds: worm drive—electric lights and generator—ten-foot loading space—a gas and tire miser and a mile glutton. Retails at \$1085—several hundred dollars less than any other truck of similar capacity on the market.

Sherlock Holmes, the balance sheet, has discovered that over-sized, unnecessarily heavy, three- and five-ton trucks are bad buys; they carry too many half loads—eat their heads off and make the repair shops rich.

Land the Maxwell for your territory and learn what real money-making means—sight sales—net profits—repeat orders and no come-backs. The mails are uncertain nowadays—telegraph "Yes" before the "other man" beats you to it.

MAXWELL MOTOR COMPANY, Inc., DETROIT, MICH.





Back view showing mirror,
included at no extra cost.

Stewart

V-RAY SEARCHLIGHT

\$5.00
Complete
with bracket
and
electric cord

A Real Searchlight—Not a "Spotlight"

When you have occasion to use a Searchlight, you want a *real* searchlight—not a "spotlight" with its small restricted "spot" of light.

You want a strong, powerful, all-revealing searchlight beam.

That is what you have in the Stewart V-Ray Searchlight.

Its penetrating shaft of light shoots 'way down the road, revealing even the most distant objects.

The exterior design is particularly noteworthy. See how it stands apart, a thing of beauty. Observe how symmetrical it is. Note the design of the body; also the back.

It is beautifully finished with many coats of jet black enamel, baked on. And, there is just a touch of nickel here and there to make the "tailor-made" appearance complete.

The Stewart V-Ray Searchlight harmonizes with the design of the modern automobile. Adds to its appearance. Looks like a built-in part of the car—not like a misplaced, re-vamped headlight.

It is scientifically designed. Made with a perfect parabolic reflector which is silver-plated—not polished tin. Has a full six inch curved lens, instead of plain window glass.

A 3 1/4 inch reducing mirror, included at no extra cost, is located in the center of the back. It is not necessary to twist the light at an unsightly angle to use mirror. The switch is located conveniently so the hand finds it instantly in the dark.

The back is so formed that the hand grasps the light naturally, without cramping—and turns the light in any direction—up, down, right, left, front, or back—with ease. The case is absolutely

dust and moisture-proof. A focusing device permits the use of any size bulb.

The bracket—an exclusive Stewart feature—not only permits turning the light in any direction, but also fits any wind shield.

Both its handsome appearance and complete utility recommend it. It has high quality and finish all the way through. Its low price—\$5.00—is not an indication of quality, but a tribute to the Stewart Organization, which makes quality accessories at popular prices possible through large quantity production.

And so it is with all Stewart Automobile Accessories. Each because of sheer merit and high quality deserves a place in the equipment of every automobile.

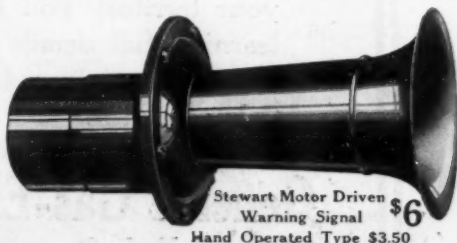
Stewart Accessories are sold by leading accessory dealers, jobbers and garages everywhere.

Stewart-Warner Speedometer Corporation

Chicago, U. S. A.



Stewart
Speedometer
\$25

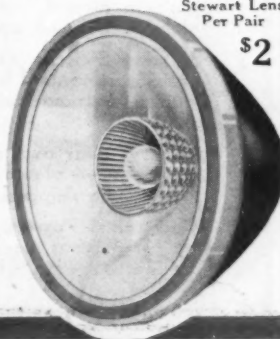


Stewart Motor Driven
Warning Signal **\$6**
Hand Operated Type \$3.50

Stewart
Vacuum System
\$10

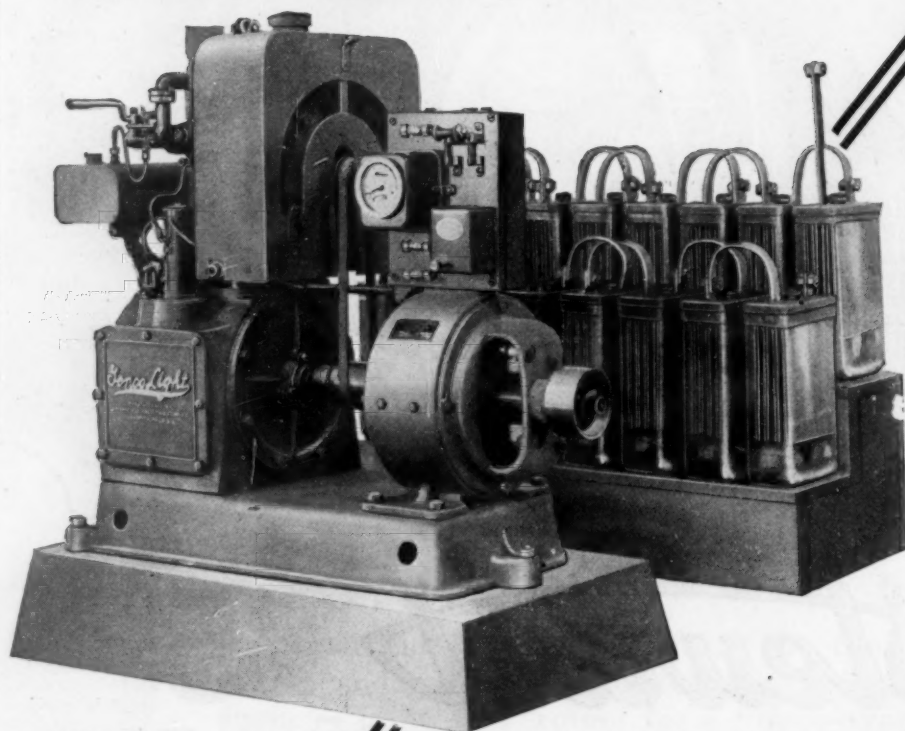


Stewart Lens
Per Pair
\$2



When Writing to Advertisers, Please Mention Motor Age

Genco Light



YOU Can Sell THIS PLANT

Consider These Features

Engine: High grade, vertical, 4-cycle, valve-in-head, counterbalanced crank, internal fly wheel.

Carburetor: Burns kerosene, gasoline or alcohol. Adjustable handle for easy starting and for different fuels. Fuel tank holds one gallon and is connected to carburetor with copper pipe.

Ignition: Special 32 volt type, distributor and coil.

Lubrication: Improved splash system of patented design. Oil gauge on crank case indicates oil level.

Cooling System: Cellular radiator, bolted to cylinder of engine; special adjustment to suit weather conditions.

Generator: Our own design specially constructed in our own factory. Gives high efficiency under rated load. Armature shaft supported by annular ball bearings.

Control Board: Bolted integral with generator; equipped with ampere hour meter — Bi-pole switch connects battery to plant. 2, 30 ampere fuses on house circuit, 5 amp. fuse on ignition circuit. All wiring at the rear completely enclosed and protected.

Starting Switch: Outfit is started by pressing button on control board. Special cutout stops engine automatically when battery is fully charged.

Battery: Our own special make, 16 sealed top glass jars — plates extra thick, insuring long life. Cells shipped fully charged.

Mechanical Power: Engine provided with pulley for driving machinery on line shaft direct. Engine delivers 2 H. P. for such work.

The sale of electric lighting plants for farm homes is the big thing these days in dealer sales.

The sale of the Genco Light offers the brightest opportunity that has yet appeared in this field.

Up to now we have been unable to keep production on the Genco Light up with the demand, but since increasing our manufacturing facilities we are now able to take care of more dealers in various parts of the country.

If you are the liveliest wire in dealer work in your territory you should be interested in learning full details regarding our proposition for the sale of Genco Light. Write us today about it.

General Gas-Electric Company
Sixth and York Streets Hanover, Pennsylvania

When Writing to Advertisers, Please Mention Motor Age



How We Sell Marathon Hand Made Tires

A TIRE isn't just a tire with us. It's a whole lot more than so much rubber and fabric. Here is what we say in our advertising to users and prospective users of Marathons —

WE look upon Marathon Tires as our business representatives; we are willing to build our reputation on the satisfaction you get in using them; and your complaint made to us about a Marathon Tire that doesn't properly represent that spirit, will get as prompt attention as if you complained about the act of an employee of our company.

That's what we think of the tires we make and in exactly that same spirit do we stand back of our dealers.

Are you selling tires on such a basis today? If not, you may be interested in knowing more about our proposition. We allot exclusive territory; perhaps we have an opening in your community.



Where are you? Let's hear from you.

The Marathon Tire & Rubber Company
Cuyahoga Falls, Ohio

Canadian Factory, St. Catharines, Ontario

WAREHOUSES:

549 W. 52nd St., New York
200 S. Highland Ave., Pittsburgh

1458 S. Michigan Ave., Chicago
700 Beacon St., Boston
3434 Locust St., St. Louis

1809 Grand Ave., Kansas City
10213 Euclid Ave., Cleveland



THE BUDA COMPANY
BUDA
ENGINE
High-Class
ESTABLISHED 1891

Our Oldest Customer

—is still with us! Buyer of the very first of BUDA ENGINES, maker of one of the greatest trucks ever built, he is *still with us!*

Better still, *most* of our customers are of the still-with-us sort. Despite keen and varied competition the very leaders among truck and tractor builders continue year after year to buy in vastly increasing numbers “those BUDA ENGINES that never seem to wear out.”

This means—*what?* It means that the BUDA ENGINE *was right* at first and *is right* now—not merely “good,” but a fine, sturdy product, thoroughly high-class clear through.

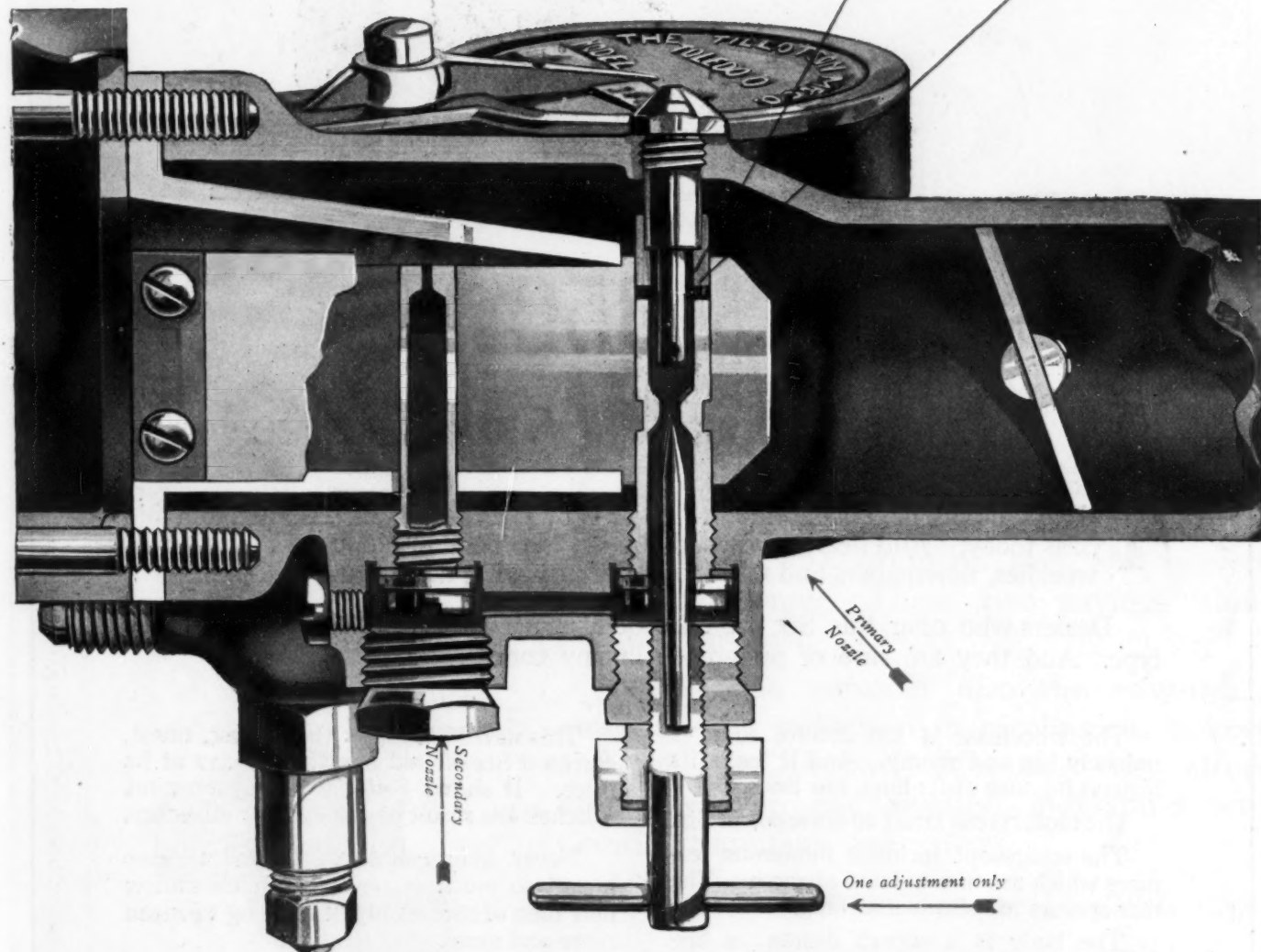
Made by The BUDA COMPANY, Harvey (Chicago Suburb), Ill.

THE BUDA ENGINE “HIGH CLASS”

When Writing to Advertisers, Please Mention Motor Age

Tillotson

CARBURETOR



Why Engineers Prefer It

OWNERS of more than 350,000 cars of varying power, size and weight value the Tillotson for what it *does*—

—for its faithfulness, efficiency and simplicity.

Engineers, however, want to know not only *what* it does, but what its *design and construction* is.

Look at the small views of Tillotson's automatic air valve feature.

See how the two flexible steel reeds expand and contract so as to maintain at all engine speeds the highest possible vacuum and greatest air velocity at the point where the fuel nozzle is located.

The Primary Nozzle furnishes fuel at all speeds, but at the slower engine speeds is the only one called upon. The only adjustment necessary on any Tillotson model is the

one that regulates the flow of gasoline.

The Secondary Nozzle automatically begins to furnish fuel at the higher engine speeds. It is the reserve supply—always ready but never used except when higher speeds demand it.

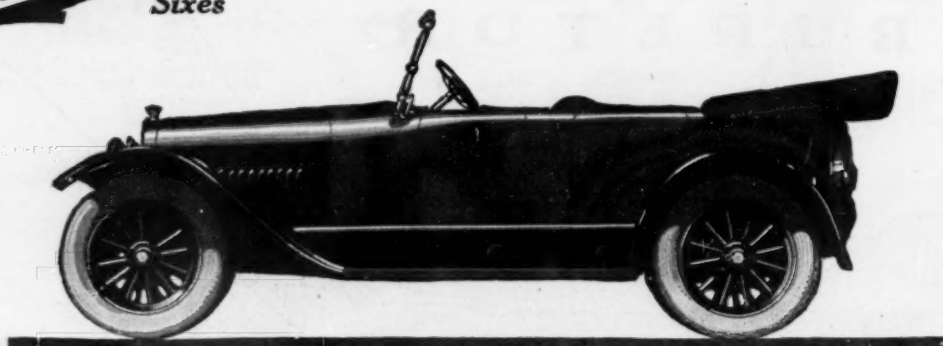
Let us prove to your absolute satisfaction the superiority of the Tillotson design. Ask for the proof.

The Tillotson Manufacturing Company, Toledo, Ohio

Mitchell
Sixes

\$1350 and \$1625

F. O. B. Racine



The \$1350 Six

Which Thousands Want to See

THE Light Six field is enormous. Here is by far the greatest Six in that big class today. And nearly everybody knows it. Tens of millions of magazines, weeklies, newspapers and farm papers are carrying this story.

Dealers who offer this Six are sure of a hearing from all who consider this type. And they are sure of preference in any comparison.

The wheelbase is 120 inches, so it is uniquely big and roomy. And it looks its bigness because of its long, low lines.

The motor is our latest 40-horsepower Six.

The equipment includes numerous features which are unusual and attractive. The rear springs are shock-absorbing.

The body is a superb design—a fine example of what our new body plant can do.

In the past year we have vastly increased the Mitchell over-strength and endurance. To do this we have added to our staff some of the ablest men in Motordom.

This car is now built to meet export requirements—the severest in the world. It is built to minimize service at a time when service men are scarce. We have doubled our tests and inspections.

This new Mitchell is the largest, finest, sturdiest Six offered anywhere today at its price. It shows better than any previous Mitchell the result of our factory efficiency.

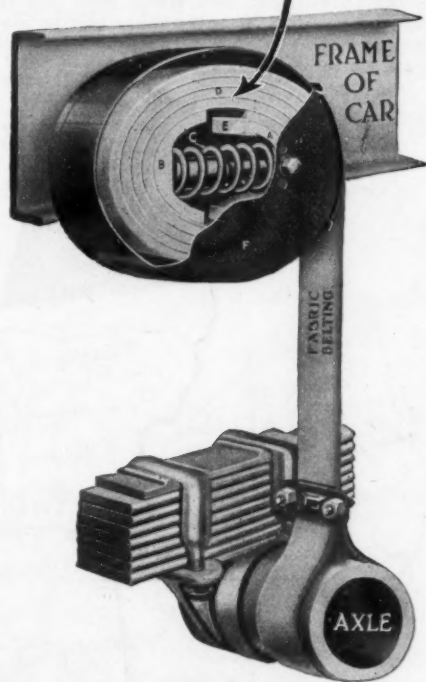
Never before has a Mitchell alliance meant so much as now. With our many new men of rare ability, it is going to mean more and more.

The evidence lies in this matchless Six. It shows in all our efforts toward extra-sturdy cars. It lies in this mammoth, model plant, which can produce such cars at such prices. And it lies in the men you will meet here.

We ask to hear from dealers who can handle to advantage such a line as this. We want to show them what such an alliance will mean to them, now and in years to come.

MITCHELL MOTORS COMPANY, Inc., Racine, Wisconsin

Prices subject to change without notice



THE harder the Bull pulls, the tighter the rope coils around the tree to hold him. The harder the Springs try to rebound, and throw you from the seat, the tighter the layers of the Snubber coil to prevent it.

Save on Tires and Springs.

By keeping the wheels from excessive bouncing up and down over the rough places, snubbers take the strain off tires and prevent spring breakage. These two savings alone repay their cost.

When you consider also the easy-riding qualities, the reduction in mechanical upkeep and the year or two of service they afford your car, you can readily understand why Gabriel Snubbers are

STANDARD EQUIPMENT on the LEADING CARS

Send for literature and name of nearest Dealer

GABRIEL MFG. COMPANY
1415 East 40th Street, CLEVELAND, OHIO

GABRIEL SNUBBERS

When Writing to Advertisers, Please Mention Motor Age



NORTH

Blue Book Scout Car No. 9

Seventeen Times Around the Earth

This is just about equal to the mileage of automobile roads charted by Blue Book Scout Cars and minutely described in the 1918 Automobile Blue Book—416,558 miles. Ten of these Scout Cars are constantly on the road and each year they thoroughly chart about a third of the total mileage described in the Blue Books. Last year, 1917, they charted 150,000 miles, equal to the distance six times around the earth.

SOUTH

Blue Book Scout Car No. 3



Wherever there are will find Blue Book the right way for

*Now—any motorist—with the Auto
that can be reached by automobile—*

MOTORISTS

You can plan your trips beforehand—before you start—in every detail.

You'll know how long it will take, what the roads are like, where to stop, etc., etc.

Then—on the road—in the car—you'll know exactly how to go.

The Automobile Blue Book will guide you every mile of the way by mileages and landmarks; tell you the interesting points en route; give you maps for cities and towns through which you'll pass; direct you to hotels, garages and service stations when you come to them; warn you of curves, grades and crossings ahead; give you speed laws and traffic regulations—in a few words, it will enable you to make the trip, without having to ask a single question before you start or after you are on the way.

Eleven
volumes
in all



All volumes are uniform in
style, size and binding.
Each \$3.00.

The Automobile Blue

900 So. Michigan Ave.
CHICAGO

243 West 39th St.,

roads—there you Scout Cars charting motorists to follow

*mobile Blue Book—can reach any place
with confidence and in absolute safety*

DEALERS

Thousands of garages and accessory dealers now realize the opportunity the Automobile Blue Book presents to them, not only as \$3.00 sales—with a profit of \$1.00 or more on every copy—but also as the means of selling other car and touring equipment.

Motorists who tour are in a buying mood. They need a lot of things. They buy most of them before they start—right when they buy their Automobile Blue Book.

One hundred and twenty-five thousand copies of this Standard Road Guide of America were sold in 1917.

If you are not selling the 1918 Automobile Blue Book you are depriving yourself of many \$3.00 sales—and also of many other good sales that you should and could have. Now—today—write for full particulars.

A Volume for every Section of the Country



Every volume averages about 1000 pages, printed on a good quality of India paper, with hundreds of maps and illustrations; bound in "Royal Blue" limp binding, stamped in gold.

Book Publishing Co.
New York, N. Y.

513 Pacific Bldg.
SAN FRANCISCO



EAST

Blue Book Scout Car No. 2

16,662 Hours Without a Stop at 25 Miles an Hour

If one Blue Book Scout Car attempted to cover all the roads minutely described in the 1918 Automobile Blue Book—it would have to travel 16,662 hours without a second's stop at twenty-five miles an hour. That's nearly two years of continuous running! But there is not one, but ten Blue Book Scout Cars constantly on the road. The Automobile Blue Books are right up-to-date. Not a mile of road goes into the Blue Book unless it has been charted first by a Blue Book Scout Car.

WEST

Blue Book Scout Car No. 1



EISEMANN

Away Goes Guesswork When Facts Step In

You need not depend upon impressions or opinions—your own or the other fellow's—to decide what source of ignition will give you the best service on truck or tractor or passenger car.

The superiority of the Eisemann Magneto is one of those demonstrated facts which are not open to argument.

Tests—competitive tests—tests under all conceivable conditions—tests conducted by ignition authorities of unquestionable standing—have proven conclusively the superior efficiency, dependability and durability of the Eisemann Magneto.

It is for this reason and no other that 126 manufacturers of motor vehicles—including practically all the recognized leaders who have established reputations to maintain—have adopted Eisemann Magnetos as standard equipment.

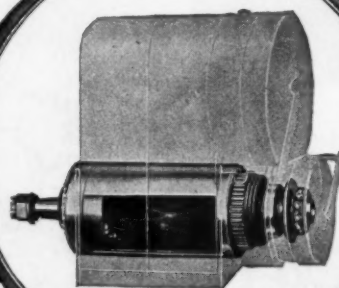
THE
EISEMANN
MAGNETO-COMPANY

32 Thirty-third Street

CHICAGO
910 So. Michigan Ave.

BROOKLYN, N. Y.

DETROIT
802 Woodward Ave.

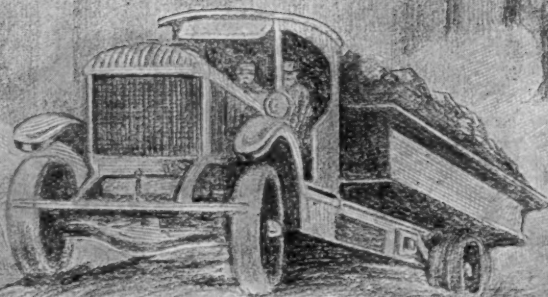


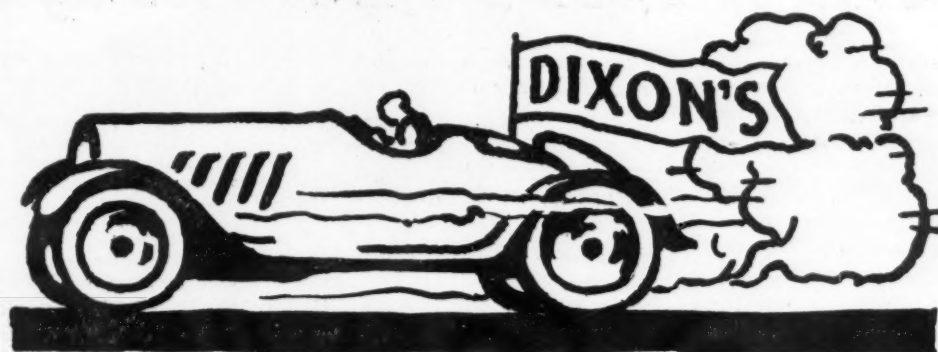
EISEMANN SUPER-CONSTRUCTION

2. The Armature

The making of the armature of an Eisemann Magneto is an excellent illustration of the exhaustive and scrupulous attention to detail through which this company has realized its determination to produce the finest magneto that can be built.

To complete the armature core and winding from raw material to finished product requires 49 distinct operations, inspections and tests. Though these processes cannot be described here, it should be pointed out that owing to the extreme care applied both to the selection of materials and to the processes of construction, Eisemann armatures practically never short circuit or burn out. The shadowgraph above reveals the position of the armature with relation to the magneto as a whole.





Dixon's Come Through with Flying Colors

In the automobile racing world, a list of races run is a list of races won by Dixon's. Practically every noted driver uses

DIXON'S GRAPHITE Automobile LUBRICANTS

"The graphite is the reason"

Racing drivers must keep their cars friction-free or their chances of winning go a-glimmering. They use Dixon's to prevent friction because they *know* Dixon's will not fail them in a pinch.

"Dixon dependability" has won the racers' endorsement. "Dixon dependability" will give you day-

in-and-day-out service when your bearing surfaces are Dixonized.

Dixon's cover the metal surfaces with a long-wearing film of specially selected flake graphite that makes your car run better and gives it a new and a longer lease on life. Write for the Dixon Lubricating Chart No. 82-G.

JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY, NEW JERSEY

Established 1827



What Kind of Used Car Does it Pay to Buy?

It pays to buy any car if you can afford to own and operate it. The answer to that question should be interesting both to the man who buys a used car and to the man who buys a new one — because the resale value is equally important in both cases.

There was a time when the purchase of a used car was seriously questioned by many good judges. There was a time when it was considered only a matter of getting rid of cars which dealers had to take in exchange.

But times have changed. The used car business today is a real business, a legitimate business, and it is handled by men who are as jealous of their reputation, are as careful to give good

value as those in any other line of human endeavor.

These men know that it is not simply the sale price of a used car that the buyer should consider, but the condition of the operating parts of that car, the reputation of the maker, the performance that cars of that make have given in the past, and the probability of the performance they will give the new buyer in the future.

And in the new car or the old car, the life and usefulness of the entire unit and the expense of operating it, all go back to the design and durability of the fundamental parts of the vehicle.

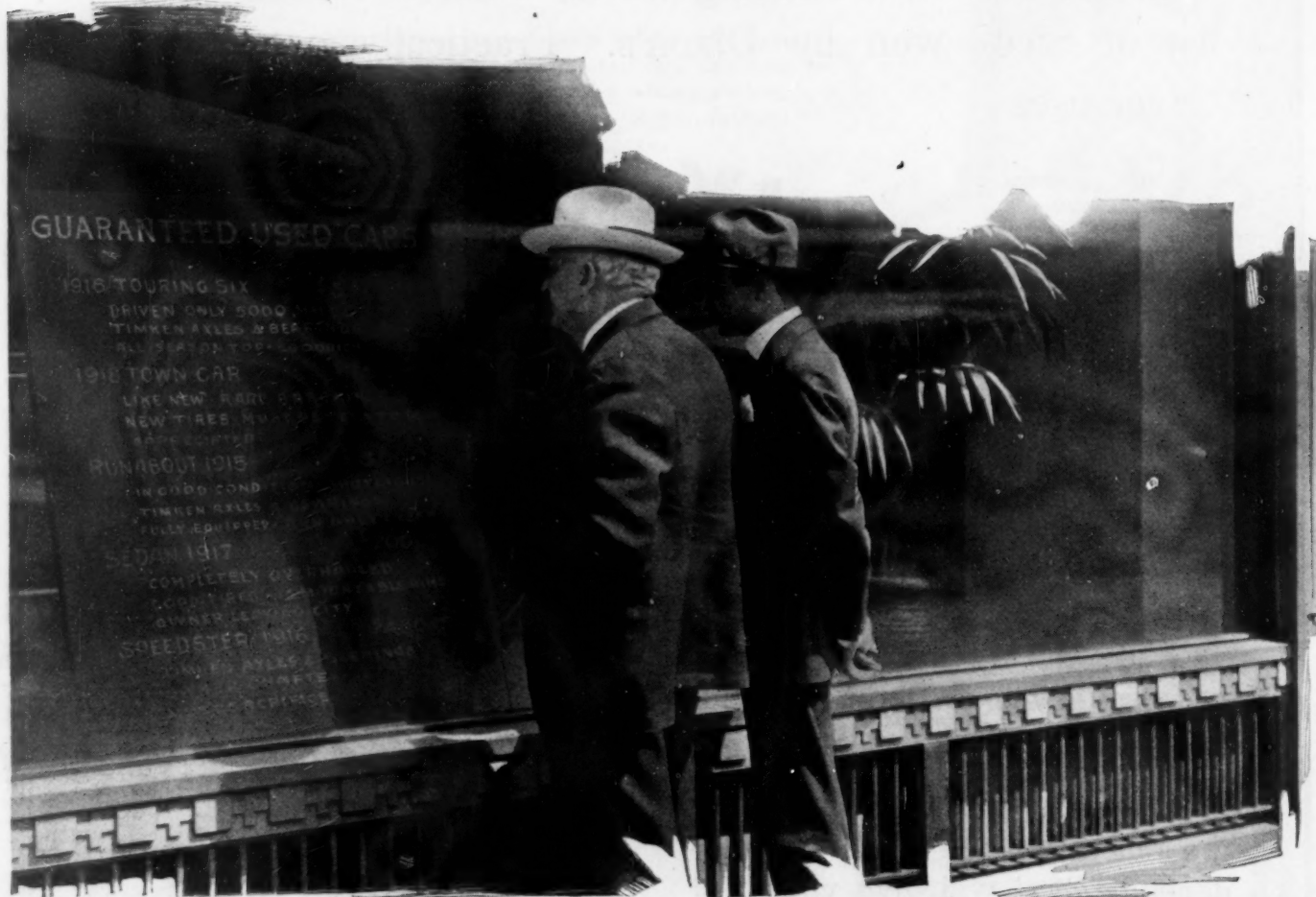
Four or five years ago the Walden Shaw Livery Company of Chicago operated a fleet of twenty taxicabs, and literally wore them out in the severest, most continuous service that a motor car can have. But under

those cars there were two units that could not be worn out, the Timken-Detroit Front and Rear axles; and those axles, after an average of over a hundred thousand miles of service, were built into a new set of cars for the company.

That represents a real practical resale value that any car owner can see. So if you are considering the purchase of a used car, don't forget the importance of axle sturdiness when you are looking at tires, listening to the motor, or examining the upholstery.

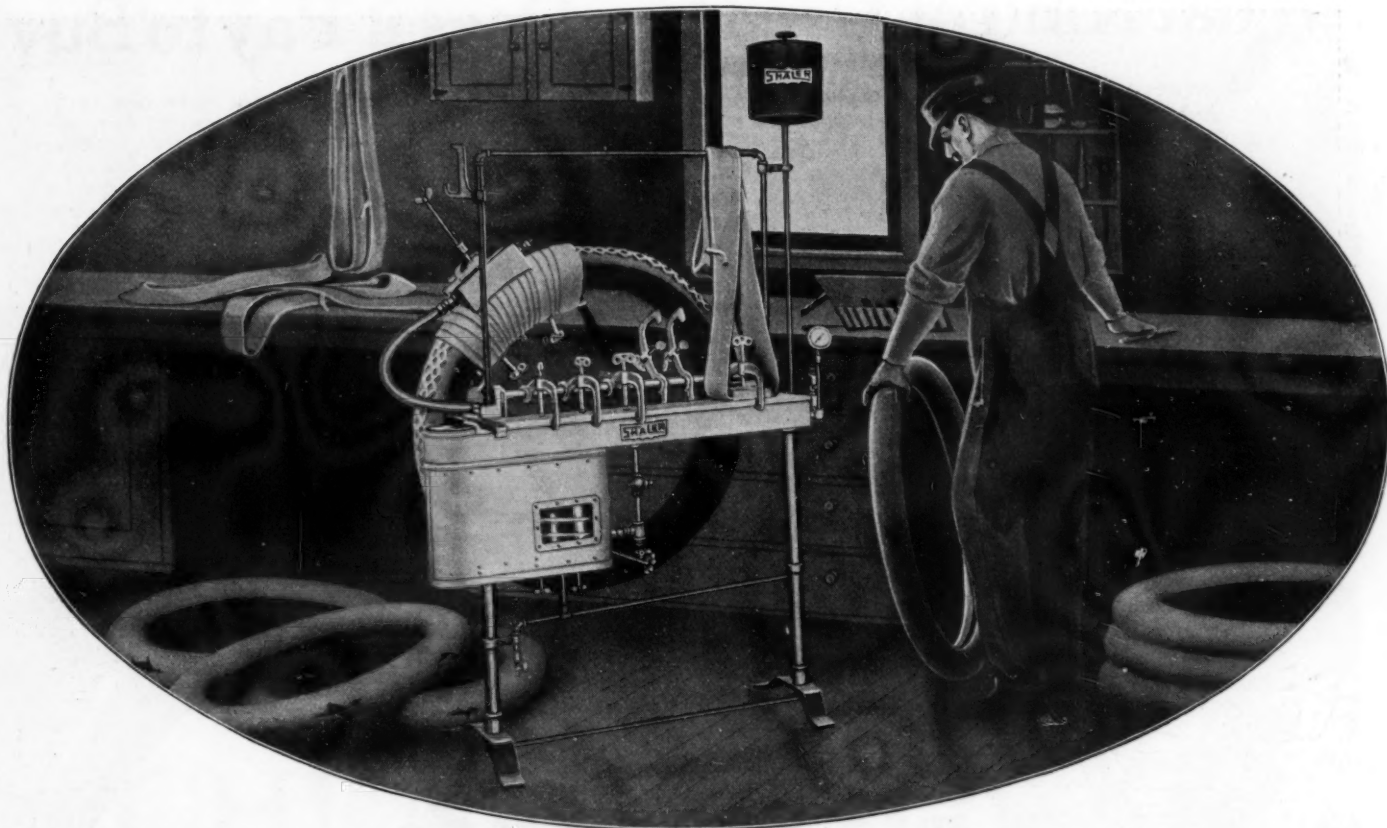
And conversely, when you buy a new car, remember that it is a fact proven out in many, many cases that the cars equipped with Timken-Detroit Axles have today the highest average resale value in proportion to their original cost.

THE
TIMKEN-DETROIT AXLE CO.
Detroit, Michigan
Oldest and largest builders of front and rear axles for both passenger cars and motor trucks.



TIMKEN-DETROIT AXLES

When Writing to Advertisers, Please Mention Motor Age



8,000,000 Tires Need Repairs!

The yearly cost of *repairing* these tires is estimated at ONE HUNDRED MILLION dollars—the greater part of this huge sum goes to the aggressive garage men, accessory dealers and repair shops who are doing tire repairing!

Think what a field there is in tire repairing! In your own locality there are enough motorists to keep you busy—and how many more are passing every day? Every one is a customer—not merely for one job—but four or five repairs at one time!

SHALER Vulcanizer

For Repair Shops and Garages

Successful results are certain with the SHALER Vulcanizer. You don't need experience—just follow instructions—to turn out perfect jobs.

By the new SHALER Wrapped-Tread Method, casings are mended quicker, better and at less cost to you than with other vulcanizers using the old method.

The SHALER Vulcanizer has thermostatic heat control, which regulates the temperature automa-

tically. This makes an explosion impossible, prevents overheating or undercuring the tire—and leaves you free to devote your entire time to repairing.

Any style or size of casing or tube can be repaired. The SHALER Vulcanizer occupies no more space than a bicycle, and can be moved about easily. Equipped for gas, gasoline or electricity—to suit your shop.

Large Capacity—Tubes and Casings

The SHALER Vulcanizer is absolutely high grade—designed for practical vulcanizing and intended for large volume of work. It handles six tubes and one casing AT ONE TIME—a total of 200 tubes and 12 casings in eight hours.

Figure out for yourself what this daily capacity of the SHALER Vulcanizer will mean! Consider the handsome profits it will earn for you—every day in the year!

Mail the coupon for our book telling all about SHALER Garage and Repair Shop Vulcanizers. It explains fully every detail of the vulcanizers—and tells all about the SHALER Money-Back Guarantee. Fill out and mail the coupon NOW—it will be your first step toward bigger profits.

C. A. Shaler Co., Fourth Street, Waupun, Wis.
Oldest and Largest Manufacturers of Vulcanizers for Motorists and Repair Shops

Mail Coupon for Catalog

C. A. SHALER COMPANY
227 Fourth Street, Waupun, Wisconsin

Gentlemen: Kindly send me at once a copy of your catalog describing the SHALER Vulcanizer for Garages and Repair Shops, and containing a copy of your "Money-Back" Guarantee.

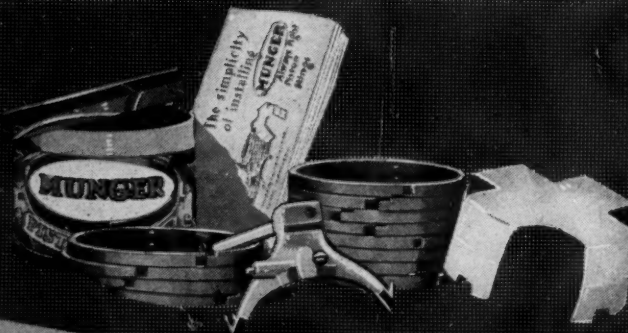
Name

Address

City and State

The MUNGER "ALWAYS TIGHT" PISTON RING OUTFIT—

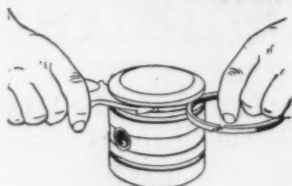
8 "Always Tight" Rings
(Regular Size)
4 "Always Tight" Rings
(Overwidth)
1 Regrooving Tool
1 Ring Insertion Tool



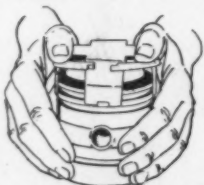
MUNGER "Always Tight" Piston Rings



Ready to insert the Munger Re-grooving Tool to true-up a worn piston groove



The Munger Re-grooving Tool in position for cutting. Testing width of groove with an overwidth ring



A Munger "Always Tight" Piston Ring being slipped over the Munger Ring Insertion Tool



Showing how easily Munger "Always Tight" Piston Rings can be placed in the piston grooves with the Munger Ring Insertion Tool

Any engine can be made positively compression-tight with these simple one-piece rings. By a patented process of peening they are made to conform to the shape of the cylinder and the Munger "Always Tight" Expansion Joint, while allowing for wear, never permits the gas to escape over, under or through them. The Munger Re-grooving Tool and the Munger Ring Insertion Tool, which accompany each outfit of these rings, are valuable aids to the car owner as well as the garage man.

SPLITDORF ELECTRICAL CO.
Newark, New Jersey

Splitdorf Branch Houses and Service Stations:

Atlanta.....10-12 E. Harris St.	Minneapolis...816 Hennepin Ave.
Boston.....68 Brookline Ave.	Newark.....278 Halsey St.
Chicago.....2613 S. Michigan Ave.	New York.....1 West 61st St.
Dallas.....402 S. Ervay St.	Philadelphia...210 North 13th St.
Detroit.....1295 Woodward Ave.	Pittsburgh...5943 Ellsworth Ave.
Kansas City...1827 Grand Ave.	San Francisco...1022 Geary St.
Los Angeles...1215 S. Hope St.	Seattle.....1628 Broadway
Toronto.....469 Yonge St.	

Accessory Dealers and Garage Men

Any jobber will supply you with Munger "Always Tight" Piston Rings. Order them now!

List price for all sizes up to 3 3/4 in. diameter, \$1.25 per ring.

With each complete outfit of rings a Munger Piston Re-grooving Tool and a Munger Ring Insertion Tool are supplied without extra charge.

The MUNGER
"Always Tight"
expansion joint





CHEAPNESS

Do not be deceived by the sound of the word.

If a thing is offered to you at a "cheap" price it is because it is not good enough to command a "fair" price or a "high" price. There is something wrong with it, or it would not be offered to you "at a sacrifice," or "reduced," or "for a song."

Remember that *you cannot get something for nothing.*

A pair of shoes at three dollars is not a cheap pair of shoes if it wears out in three weeks. It is infinitely dearer than the shoes for which you pay six dollars, if these last you six months.

There is this same difference in automobile tires. A ten dollar "second" that lasts 500 miles is not as cheap as a good fifty dollar tire that lasts five thousand miles.

Bergougnan Tires are cheap tires because they give you more miles per dollar than most tires.

Because they are so good the impression has spread that they must be expensive.

To correct this popular error we quote a few prices, taken from our latest list:

	Plain	Non-Skid	Red Tubes
32x3½	\$26.70	\$29.35	\$4.60
33x4	35.80	39.40	6.15
34x4	37.80	41.60	6.30
35x4½	51.85	57.05	7.80
35x5	60.50	66.55	9.10
37x5	63.50	69.80	9.55

What other tires will give you seven—yes, even eight—thousand miles for so little money?

Our MINIMUM guarantee is five thousand miles.

Get in touch with us to-day. Our selling proposition is a very attractive one.

We may be able to give you the exclusive rights for your territory.

BERGOUGNAN TIRE CORPORATION

49 WEST 64th STREET, NEW YORK

Canadian Agency—325 St. James St., Montreal

When Writing to Advertisers, Please Mention Motor Age

NORWALK

Protected Territory on the Coming Tire

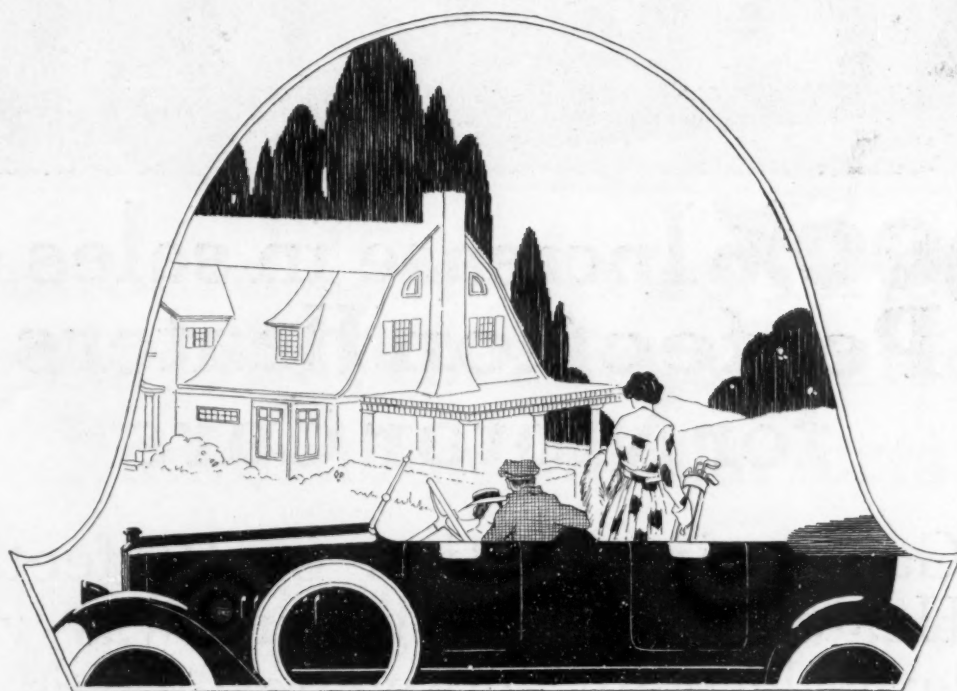
YOU can assume quality when you consider the sales record of a business as young as the Norwalk business. The growth of this business in four years is misleading only in one way—you might forget the years of experience behind its establishment. It reflects the experience of rubber tire and tube making from the beginning of the industry and the best standards of manufacture up to date. Nothing short of the best tubes and casings would satisfy the makers of NORWALK Casings and Tubes. In addition to the satisfaction that comes from leadership in quality, there is the practical business sense that realizes that to build business permanently, re-sales to old customers is the one way.

Norwalks are offered dealers on a protected basis. Some few will take advantage of the Norwalk franchise now—others later. Through the trade the word is passing, "Get the Norwalk Agency." Correspondence invited.

NORWALK TIRE & RUBBER CO.
NORWALK, CONN.



HIGH PRESSURE
CASINGS AND TUBES

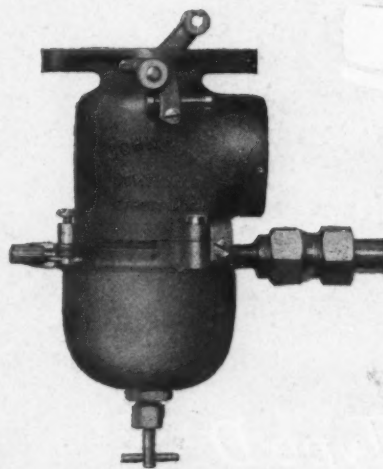


JOHNSON CARBURETOR

**Saves the Battery—
Saves the Starter.
Designed and Built
to Insure Quick
Starting**

Business Solicited
from
Manufacturers
only.

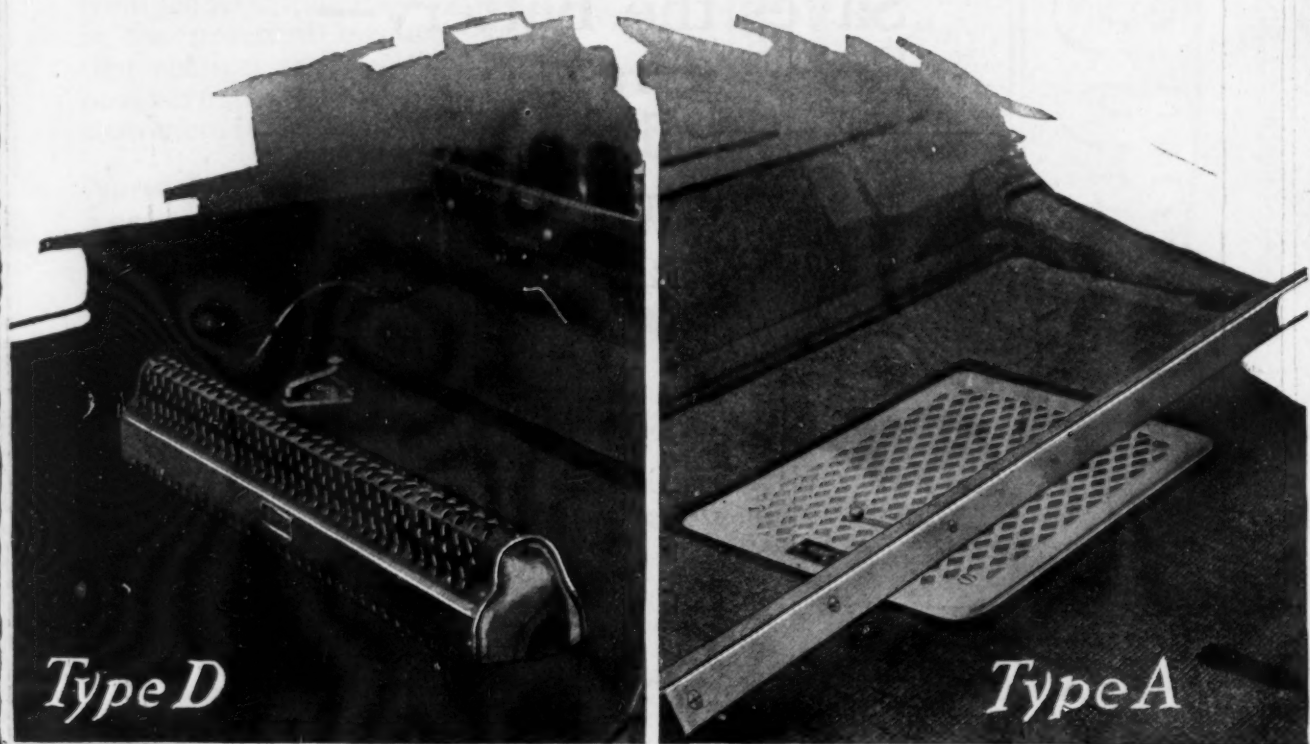
JOHNSON COMPANY
Makers of Superfine Instruments of Carburetion
DETROIT MICHIGAN



STANDARD

300% Increase in sales of Perfection Heaters for Motor Cars

Garage installation of Perfection Heaters in existing cars was very large last fall and winter. This demand will be still greater starting with the first cool days and nights of September and October.



Type D

Type A

PARTS

for Motor Cars, Trucks,
Tractors, Motorcycles,
Airplanes and other Vehicles

Standard Parts Axles, Perfection Springs Bock Bearings Standweld Rims, Tubing, Tubular Parts

The Jobbing Trade will be looked to for supplies.

It is important that demands be anticipated for the further reason, too, that transportation difficulties, certain to come as winter approaches, may be avoided.

The merit of Perfection Motor Car Heaters is everywhere recognized.

Twenty-four motor car manufacturers now make them regular equipment on one or more models.

The Standard Parts Company

Executive Offices, Cleveland, Ohio

Factories: Cleveland, Toledo, Cincinnati, St. Louis, Canton,
Flint, Pontiac, Connersville and Wheeling

SAVES 30 to 50%
GASOLINE ON
ALL MOTORS

SUNDERMAN

GIVES GREAT
INCREASE IN
POWER AND
FLEXIBILITY

Vacuum Carburetor

Every Mail Brings an Unsolicited Testimonial from User or Dealer

BELOW we print a few testimonials, selected at random from letters that have come to us within the last few weeks. As is true of all commendatory letters we have printed in these pages, these enthusiastic comments have come entirely unsolicited. They speak for themselves better than ordinary advertising copy—so judge for yourself.

Increases Mileage 121 Per Cent

Jan. 15, 1918.
SUNDERMAN CORPORATION: Was getting about 12 miles on a gallon of gas and my Ford car would balk on hills. Installed one of your carburetors and the results were wonderful. I can make most any hill on high, made forty miles on a gallon and a half of gas. It has paid for itself several times its cost. If I couldn't get another I would consider it priceless.—WILLIAM J. BUEHLER, Scarsdale, N. Y.

"They Are Wonders"

May 23, 1918.
SUNDERMAN CORPORATION: Carburetors sent by Parcel Post received. They are wonders. Kindly rush four more Parcel Post, C. O. D., Ford size.—R. W. LYNN, New Enterprise, Pa.

Makes Good in Gruelling Test

May 18, 1918.
SUNDERMAN CORPORATION: I have put your carburetor to some very severe tests; want to tell you that I am more than pleased with it. I just returned from a trip in the northern part of the State, and there is plenty of sand there, enough to try any make of machine, but with your carburetor the little Ford acted as though it enjoyed that kind of travel, and had plenty of kick all the time.—W. H. FISHER, 1940 Frances Ave., Grand Rapids, Mich.

Repeat Order the Best Testimonial

May 20, 1918.
SUNDERMAN CORPORATION: On Jan. 28th I bought a Sunderman carburetor. We like it so well I want you to send me two by express for a Ford car, check enclosed.—J. C. POWELL, Fort Meade Cycle Shop, Fort Meade, Florida.

Approval From an Expert

June 1, 1918.
SUNDERMAN CORPORATION: A customer of ours, Mr. Bauer, placed his order for one of the Model "BB" Carburetors, which order is enclosed. He has been using a Model "F" Sunderman Carburetor on his Ford car for over two years, and is much pleased with it. Mr. Bauer states he has received as high

service as thirty miles per gal. on his Ford with a Sunderman, and averages at all times 27 miles. He is chief chemist of the largest independent starch factory in the world, and made the test when the gasoline was cool in the tank of his car, thereby not taking advantage of expansion. He recently made a run from Chicago to Cedar Rapids, a distance of approximately 260 miles, and he states that the carburetor performed very nicely during the whole run. We are merely making this report as we assume you are pleased to receive this information.—NEWELL CONSTRUCTION & MCHY. Co., Cedar Rapids, Iowa.

Makes Good in Shifting Sand

March 7, 1918.
SUNDERMAN CORPORATION: I gave the Sunderman carburetor a more severe test than you ever thought of. A few miles out from Live Oak is a nine-mile stretch of sand road (by sand I mean loose dry sand), that auto drivers avoid by driving about five miles around. After the carburetor was adjusted I took my car over that road. I went in at one end in high gear and came out at the other end without changing gears, and without a miss in the engine, and that is what I call "going some." With the old carburetor the car would not perform stunts of that kind. The drivers I have spoken to about it say it sounds "fishy," as they claim it is impossible to drive that road in high. The carburetor is absolutely O. K., and if anyone from this section of the country makes inquiries refer them to me, and I will demonstrate to them what it will do.—A. E. WRIGGLESWORTH, Live Oak, Fla.

Stops Spark Plug Fouling

May 23, 1918.
SUNDERMAN CORPORATION: Please ship me by special delivery parcel post another Ford Sunderman carburetor. You might like to know what I did with the carburetor I received from you last Tuesday. It was put on to a 1916 Ford, which would not run six miles without cleaning one and two spark plugs. I have run this car now about a hundred and fifty miles and have not had a skip from the motor. It really seems unbelievable, and before I announce my find to the trade would like to try a carburetor on a 1915.—ARTHUR L. RYAN, G. M. C. Trucks, Webster, Mass.

Over 61% Increased Mileage

March 6, 1918.
SUNDERMAN CORPORATION: Send me by express at once C. O. D. one more of your Sunderman Carburetors for Overland car No. 75, 1916. I put the Sunderman Carburetor on my Ford car you sent me on ten days' trial, and I am getting 29 miles on one gallon of gas on the state roads where I was only getting 16 to 18 miles on the other carburetor. I am well pleased.—FRED W. WARD, Wellsville, N. Y.

"Surpasses All Expectations"

April 25, 1918.
SUNDERMAN CORPORATION: Words are beyond me to express my thanks and appreciation of the Sunderman Carburetor. I must say it surpasses all expectations, and when I first saw it I could hardly believe such a small instrument could run my Stoddard-Dayton, but she certainly moves and keeps on moving with a saving of gasoline.—R. A. WATSON, 420 E. 153d St., Bronx, N. Y.

34 Miles on One Gallon

May 29, 1918.
SUNDERMAN CORPORATION: Will you please quote me best prices on your Ford Manifold? I am using one of your carburetors and will say I have tried several makes and yours has given me the best satisfaction. I drove to Gladbrook and back last Sunday on one gallon of gas, a distance of 34 miles.—R. H. CHENEY, Grundy Center, Iowa.

Ran 35,000 Miles Without Trouble

June 14, 1918.
SUNDERMAN CORPORATION: Send me a carburetor for my Ford car. I have sold my car and the fellow who bought it would not let me take it off. I used the one you put on my car last year and ran it 35,000 miles and never had any trouble at all.—FRANK R. WITMAN, Albany, N. Y.

A Dominie Gives Testimony

June 10, 1918.
SUNDERMAN CORPORATION: The Sunderman Carburetor which I installed on my Maxwell Model '14 last year has given more than mere satisfaction. It is a marvel of economy, and has practically cut our gas bill down to one-half. We have averaged 30 miles per gallon on Standard Oil Co. gasoline, using exactly 10 gals. on a 300 mile trip.—REV. G. MACK, Ashton, Ill.

Model BB

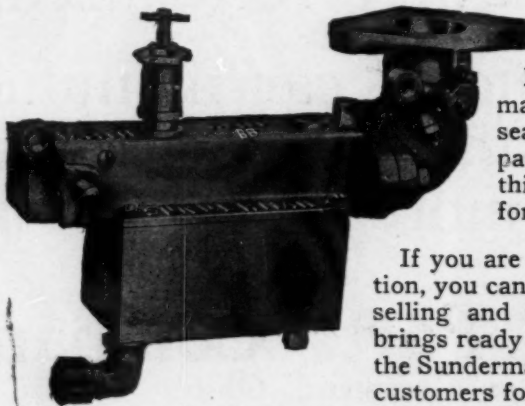
\$8

WITHOUT CONNECTION
\$10 with regular connection
\$12 with special connection

Model F—
Special for
Ford,
Metz
and
Saxon
Four

\$6

F. O. B. Newburgh



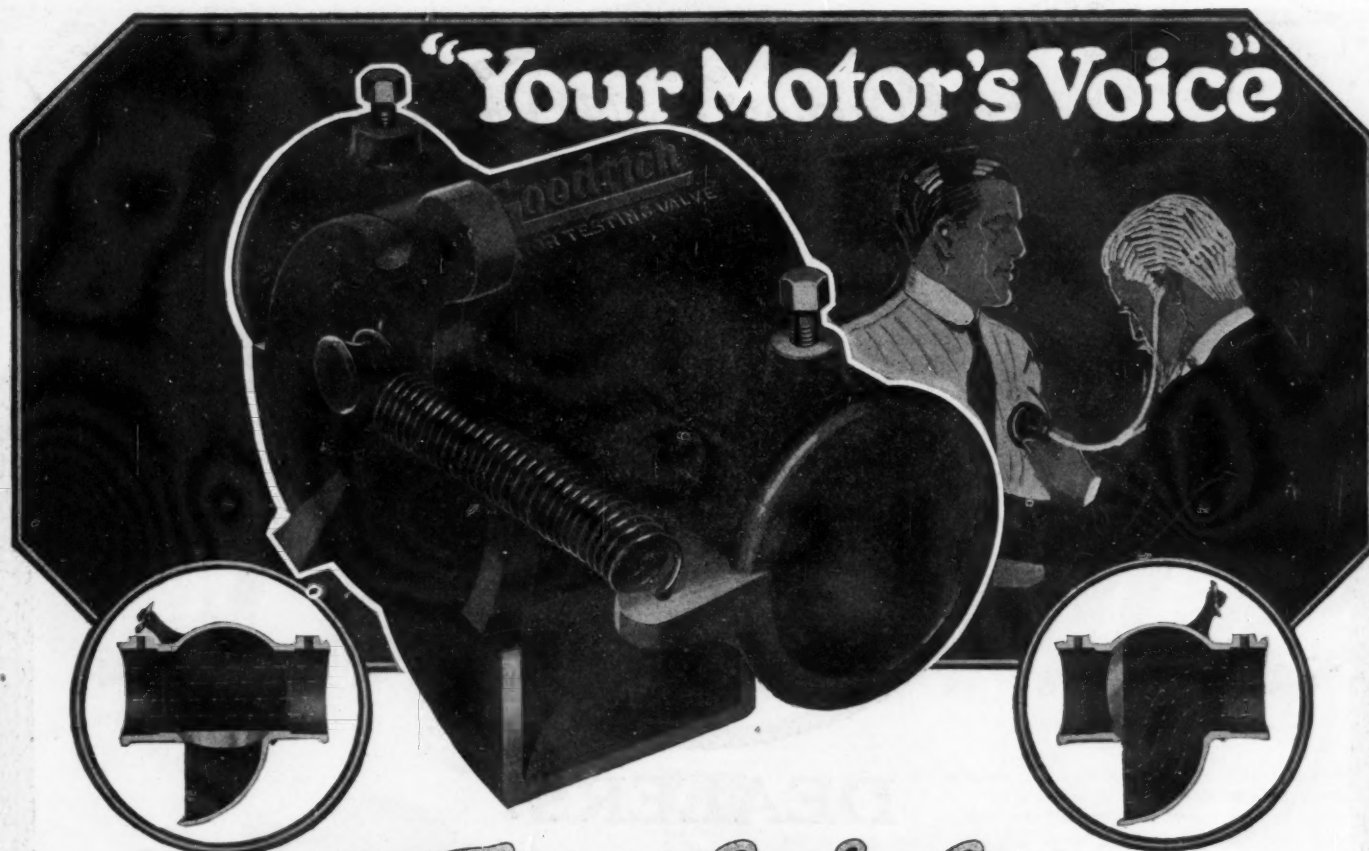
Order NOW!

If you are a car owner, you want the Sunderman Carburetor now—the bigger part of your season's driving is just ahead of you, and it is the part of good business sense and economy to let this matchless instrument begin to make good for you at once.

If you are a dealer or operate a garage or a service station, you can make a great deal more money this season by selling and installing this great carburetor. The price brings ready sales, it holds a substantial profit for you, and the Sunderman Carburetor positively makes and holds good customers for you.

Sunderman Corporation, 11 Chambers St., Newburgh, N. Y.

PACIFIC COAST BRANCH: 593 MARKET ST., SAN FRANCISCO, CAL.



A bisected valve—showing closed position. Note the knife edge of the revolving shutter. It prevents the formation of carbon inside the valve.

Goodrich

MOTOR TESTING VALVE

(Replacing old style cut-out)

Open position. The bell shaped mouth intensifies sound and relieves the engine of all back pressure.

Detects Trouble Before Damage Results

JUST WHAT THE Stethoscope does for the physician, the Cut-Out does for the motorist.

The Stethoscope makes the heart beats sound loud in the Doctor's ears, so that he can judge of the heart's efficient performance.

If he hears anything wrong, he will take immediate measures to correct it, "in time to prevent serious developments."

That is the Big Advantage of the Goodrich Motor Testing Valve—the discovery of faulty motor operation "in time to prevent serious results," and costly repairs.

There are other ways of doing this, of course. But the correct Cut-Out provides the simplest, the easiest and the

surest. It is so easy to operate that the motorist will use it, whereas other methods are steadily neglected by the great majority of car owners.

We recommend the GOODRICH MOTOR TESTING VALVE as the best form of Cut-Out you can buy. It is correctly designed, strongly constructed of the best materials, and will remain in good operating condition as long as your car lasts.

The sharp knife edge of the shutter prevents the formation of carbon inside the valve and makes "sticking" or faulty operation impossible. It *always* works quickly, easily and unfaillingly.

When in use, it produces a very loud, sharp ringing note that can easily be heard above the din of repair shop or

garage and relieves the motor completely of all back pressure.

Made in all sizes for all makes of cars, at prices to fit your pocketbook. Sold complete with pedal, pulley and chain. For sale by good dealers and jobbers everywhere or direct. Give year and model of car when ordering direct.

DEALERS

If you are not already handling this new type Cut-Out, we predict that you soon will. It possesses many desirable features not to be found in old style Cut-Outs and Goodrich advertising, plus price, is building a big demand you can cash in on. Order through your regular jobber or direct. Immediate deliveries.

THE GOODRICH-LENHART MFG. CO.
419 Widener Building Philadelphia, Pa.

Members of the National Association of Automobile Accessory Jobbers

When Writing to Advertisers, Please Mention Motor Age



DEALERS!

BEAT THIS OFFER IF YOU CAN

Any of our dealers may install W. & C. Shock Absorbers on Ford cars under a 10 days' trial offer. If at the end of that time the user wants to do without them, take back the shock absorbers, refund the purchase price and return the shock absorbers to us. We will return to you the price paid for them and give you two dollars for your trouble in putting on and taking off the shock absorbers.

There is no red tape about this proposition. It's a fair and square business dealing. We want to show dealers that W. & C., the Original Double Arm Shock Absorbers for Ford cars are absolutely and without exception the best on the market today. This is the best way we know of to prove our point.

You can easily see that if we did not **know** that W. & C. Shock Absorbers will prove 100% satisfactory we would never make such an offer as this.

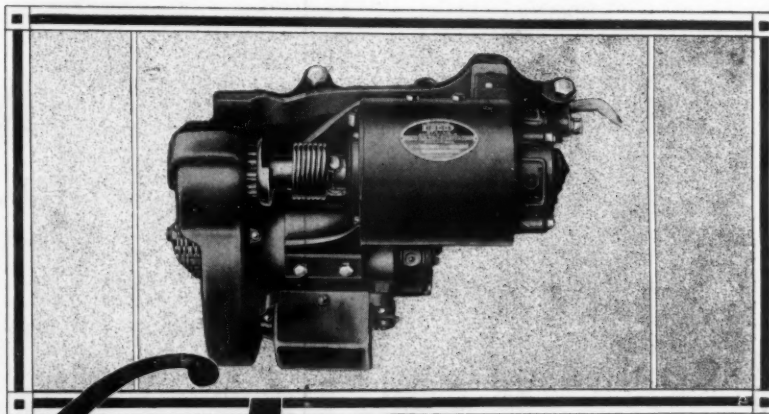
If you are not already selling W. & C.'s you had better drop us a line for full particulars.

Write today

P. H. WEBBER COMPANY, Hoopeston, Illinois

IT REPRESENTS THE RIGHT PRINCIPLE

Disco
DEPENDABLE PRODUCTS



Confidence



Max Hagelstine

Disco Factory Manager

*Ask any Studebaker dealer if he thinks
Hagelstine will produce Disco Systems right.*

THE dealer who handles the Disco Electric Lighting and Starting System for Ford Cars, or the car owner who buys one, can have perfect confidence that every system which leaves the plant will be made right and that the Disco Company will stand behind it to make good every difficulty that may arise.

This confidence is based not on promises, but on the character of the organization building the Disco.

Consider these Facts:

Disco Company owned by Jordan. Mr. Arthur Jordan of Indianapolis is the sole owner of the Disco Company, and has put his abundant resources behind the organization, to make the Disco a leader in its field. Few men in the country have as high a financial standing as Mr. Jordan. Bradstreet's or Dun's is proof of this.

Managed by Emerson. The Disco Company is managed by Mr. Dean Emerson, a man who is without a superior in the electric lighting and starting field. Sixteen years with The Wagner Electric Company of St. Louis, is his record.

Sold by Prescott. Mr. Harry F. Prescott, Disco Sales Manager, and former Middle West Sales Manager of the Saxon Motor Car Company, has spent fifteen years learning the problems of dealer and distributor.

Designed by Webster. Mr. S. F. Webster, designer of the Disco System, is an acknowledged authority on starting and lighting systems. He has been connected with The Wagner Electric Company since they first started to make electric lighting and starting systems.

Produced by Hagelstine. Mr. Max Hagelstine is now Production Manager of the Disco. Hagelstine gained an international reputation through his work with the Studebaker Corporation, in charge of service, and the entire experimental department. Any Studebaker dealer will tell you that his coming to the Disco Company is one of the most important events that has ever occurred in the starting and lighting field.

And We Can Make Shipments. The resources of the Disco Company have enabled us to cover ourselves on materials so that we can absolutely guarantee prompt shipments.

Dealers—Send for Proposition. The Disco offers good opportunity for profit now, when some lines are "off." Our proposition is sound, safe and profitable. Write today.

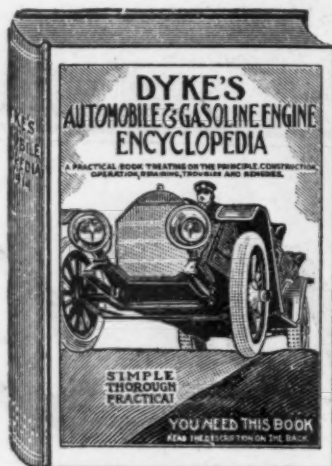
Disco Electric Manufacturing Company, Detroit, U. S. A.

When Writing to Advertisers, Please Mention Motor Age

DYKE'S AUTOMOBILE AND GASOLINE ENGINE ENCYCLOPEDIA

A Standard Work on Automobile, Truck, Tractor and Aviation Engines

Seventh Edition Revised 1918



If you wish to learn automobile construction, principles of ignition, carburetion and all electric systems, including repairing and adjusting—in a systematic, progressive manner—then this is the book you should have.

It is a text and reference book on everything pertaining to motoring. Simple as the A B C's. It's worth its cost if only placed on the shelf and used as reference.

The U. S. Government took all of the Sixth Edition issued in revised and enlarged form in January, 1918, and the Seventh has just been published. This contains a lot of new material on airplanes and trucks.

There isn't a trouble, repair or adjustment that cannot be found in this authoritative work.

If you don't find it's worth twice the price—you can return it. Order today—NOW—and see for yourself just what a valuable book it really is.

SOME OF THE SUBJECTS TREATED

in the Seventh Edition, 1918, of Dyke's Auto Encyclopedia.

ASSEMBLY OF A CAR: How the car is assembled from the ground up; Steering, Springs and Brakes—how to adjust all leading makes; Axles, construction of different types and how to remove parts and adjust; Clutches, all leading types as cone, disk, etc., fully explained; The Borg and Beck and others, as the Cadillac, Reo, Buick and all leading clutches are explained and how to adjust; Transmissions are covered equally as well as the clutches.

ENGINES. From the name and purpose of parts, principle and all details—you are taken step by step to 6, 8, 12-cylinder engines; how they fire, laps of power strokes, valve timing, adjusting, etc. The sleeve valve engine is also treated. 89 pages, 291 illustrations.

CARBURETION: From the first principles of the auxiliary air valves to metering pins and dash pots; how to adjust all leading makes, etc.

LUBRICATION AND COOLING is thoroughly simplified. The Hudson and other systems explained and how to regulate the oil pressure. Water and air cooling is dealt with in the cooling subject, also troubles and remedies—21 pages, 81 illustrations.

IGNITION from the early systems to magnetos, coil and battery. The most complete instruction on ignition in the world today and all leading systems simplified. Ignition timing of all leading cars included. 115 pages, 375 illustrations.

ELECTRIC SYSTEMS: Every leading electric system you can possibly think of is fully covered. From the principle and construction of generators and starting motors to the care, adjustments and repair and all leading **WIRING DIAGRAMS.** 118 pages, 238 illustrations.

STORAGE BATTERIES: This subject not only includes the principle and construction and the chemical action of a storage battery, but the subject of **repairing** is fully dealt with. 46 pages, 162 illustrations. The "Owen Magnetic" and Cuttler "electric gear shift" is thoroughly simplified.

OPERATION AND CARE OF A CAR, and other subjects, such as Touring, License, Laws, Insurance; How to select a car. The Automobile Salesman, Tables, Specifications of all Leading Cars and many subjects are fully covered.

TIRES: Every detail, from construction to repairing.

TROUBLES AND REMEDIES: How to locate troubles by process of elimination.

REPAIR SUBJECT

1189 Illustrations—154 Pages.

THE AUTOMOBILE REPAIRMAN: This is a very lengthy subject and is divided into several parts. The first part deals with the equipment necessary for doing light repairing, and explaining how one can enter the automobile repair business with limited capital. Also features the qualifications necessary of one starting into the business.

GARAGE AND REPAIR SHOP EQUIPMENT: how to build several sizes of garages and shops; how to light and heat it; how to adopt an office system; how to equip the garage with fixtures, as oil tanks, washers, etc.; how to equip the shop with tools and machinery; how to divide the business into departments and how to add money making additions, as tire repairing, auto accessories, electric department, welding, etc. Applies to small as well as large garages.

REPAIRING AND ADJUSTING ENGINES: first the cleaning and greasing of a car is treated, then the engine is overhauled; cleaning carbon mechanically, chemically, and with oxy-acetylene method; grinding valves, testing compression; testing for knocks; adjusting bearings; fitting rings; fitting pistons; reboring cylinders and fitting oversize pistons and valves, etc.

ADJUSTING CLUTCHES TRANSMISSIONS AND REAR AXLES: explaining how to disassemble the rear axle of "semi" "three-quarter" and "full" floating type; the principle, construction and how to distinguish the different types at a glance.

Principle of construction and adjustment of universal joints, rear wheels, etc., fully treated.

ADJUSTING FRONT WHEELS, BRAKES AND STEERING DEVICES: explaining leading makes; relining, overhauling, cleaning and adjusting brakes; how to "toe-in," "camber" or align wheels and the importance of same.

HOW TO USE TOOLS AND MAKE REPAIRS: how to read measuring instruments, as micrometers, calipers, etc.; how to tell the different kinds of bolts and screws and threads; how to use taps and dies and cut threads; how to use drills and how they are numbered and lettered; how to read a drill gauge; how to solder, braze, case-harden; how to bend tubing, draw file, use chisels, etc. S. A. E. and U. S. S. threads explained; how to repair radiators; how to make gaskets; how to adjust silent chains, etc.

OXY-ACETYLENE WELDING and cutting with 60 illustrations.

USEFUL SHOP HINTS—illustrating many labor saving short cuts for the automobile repairman and miscellaneous shop hints, such as, how to straighten fenders, lamps, metal bodies, frames, etc.; how to make useful devices for the shop, etc.

SUPPLEMENTS

332 Illustrations—91 Pages.

FORD SUPPLEMENT: describing and illustrating the principle of construction; adjustments and repairs. Some of the additional subjects are: How to get more miles per gallon; how to overhaul a Ford; how to make a Ford do 60 miles per hour; how to convert a Ford for commercial use; how to construct a combination body; how to construct a Ford racer; "fine-point" adjustment, etc., etc.

PACKARD SUPPLEMENT: a complete detailed instruction on the principle, operation and adjustments with two-colored illustrations.

AIRPLANES AND AIRPLANE ENGINES: principles of flight. Control members and all details fully explained.

916 Pages—3362 Illustrations.

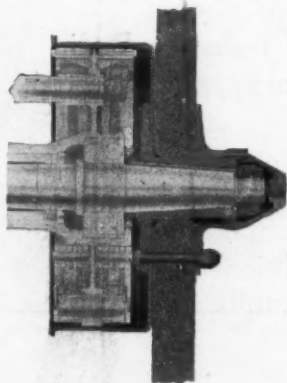
Cloth Bound. Price, \$3.80 Postpaid

U. P. C. BOOK COMPANY, Inc.

Successors to Book Departments of
Motor Age, Motor World, Automotive Industries, Commercial Vehicle

243-249 West Thirty-ninth Street, NEW YORK CITY

When Writing to Advertisers, Please Mention Motor Age



THE TAPERED HUB MOUNTING

allows the easy demounting of wheels and makes inspection or tire changes quick, easy and economical. The shape of the hub also gives greatest strength where strength is most needed.

SHELDON

WORM DRIVE REAR AXLES

Frequent Inspection Made Easy

Periodical inspection is an important factor in the maintenance of truck efficiency.

Any truck driver or workman can easily remove the rear wheels of a Sheldon Axle equipped truck in a few minutes' time employing just six very simple operations for each wheel. He need not touch or even expose the ball bearings which remain completely enclosed.

At the same time the wheel bearings themselves are easily accessible, for to get at them you merely remove the wheel and then the bearing retainer. It is typical of Sheldon design to combine great strength with extreme simplicity and ready accessibility where frequent inspection is desirable.

SHELDON AXLE & SPRING CO.



*Makers of Springs and Axles for Heavy
Duty Service for more than Fifty Years*



WILKES-BARRE, PENNSYLVANIA

The Boast of the Hun

The Germans insisted that America would not and could not transport soldiers to France.

They prophesied that the United States could not build ships fast enough to give the Allies any substantial help.

They said we could not ship food to the Allies. They said that the United States would not cut any figure in the fighting.

They now say that the American business man is not clever enough to realize that "It pays to advertise in war as well as in peace," and also that "The far seeing business man never stops advertising."

The articles on the opposite page, reproduced from the Berlin "Tageblatt" and the Berlin "Lokal Anzeiger" are typical boasts of the Hun.

American business men may have reduced their advertising expenditures to some extent, but this is merely temporary in order that they may adjust war business to war conditions. They are too well versed in business to neglect any opportunity for the protection of their future.

They will not sacrifice good will. They will not be blinded to the fact that it is necessary to campaign NOW for leadership THEN.

The boastful Hun is hopeful that the advertising activities of the American business man will cease.

US and the Hun

Printers' Ink, June 6, 1918

Germany Gloats Over Decrease in American Advertising

Significant Paragraphs from Famous German Papers,
From the Berlin "Tageblatt," Apr. 26, 1918.

"If the despised Yankee nation think they are going to win the war and force Germans out of foreign markets there is nothing to indicate this sentiment in their local and foreign advertising. Many of their advertising agencies have closed their doors through lack of patronage. Their much-talked-of captains of industry have cancelled advertising contracts everywhere. Germany and German merchants have increased their advertising space in neutral markets and at home. It pays to advertise in war as well as in peace. The farseeing merchant never stops advertising."

From the Berlin "Lokal Anzeiger," Apr. 20, 1918.

"Nothing is more acceptable to the German nation than to note the fact that the North Americans have abandoned advertising their goods in practically all of the foreign markets. In the Latin-American publications, the market which they have always tried hardest to acquire, there has been a heavy loss of advertising. A prominent Buenos Aires agency announces the fact that 83% of their United States advertisers have cancelled their contracts. This is also true in the Orient, and a careful compilation of the decrease in advertising there shows a greater depreciation than in South and Central America. In the United States itself there is not a paper which has not suffered a loss in its advertising lines, and that despite the fact that the last year showed an increase in the millionaire class of 973 individuals. In other words, the war has terrorized the American nation, but not the Germans, for a perusal of their periodicals will show that manufacturers still advertise even if they have not the goods to deliver, but with the idea of keeping their name before the public."

32



JEWELL BATTERY GAUGE

The EVER WATCHFUL GUARDIAN of YOUR BATTERY

One glance tells what is going on in the battery. You get a warning before it is too late—the only time a warning counts.

A device of this kind, which saves its cost the first serious battery trouble it averts, belongs on the dash of every battery-operated car. It is the most effective necessity which has lately appeared on the market.

It has met with instantaneous acceptance among car owners. Jobbers and dealers find it a splendid seller the year 'round. Price, \$5.00.

Write for Full Particulars

Manufactured by
The Jewell Electrical Instrument Co.
1646 WALNUT STREET, CHICAGO

Sole Distributors
Gray-Heath Company
1440 Michigan Ave., Chicago



At Our Risk— You Can Prove It

Don't waste good money on tire pumps that either break your back, or pump Rubber Rotting oil particles or gasoline fumes into your tires.

Take No Chances

At our risk you can prove that the "Dead Easy" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write today, NOW,
for fifteen day—no money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN, U. S. A.



Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why Crystal Sheet is the logical glass for your cars.

AMERICAN WINDOW GLASS CO.

World's Largest Producer

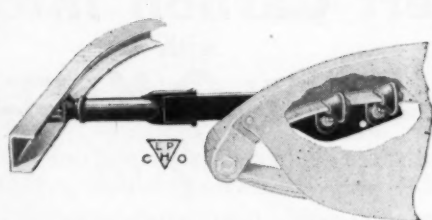
GENERAL OFFICES: FARMERS' BANK BLDG.
Pittsburgh, Pa., U. S. A.

HALLADAY

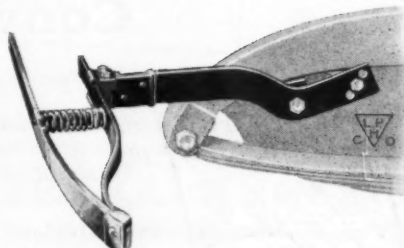
UNDER CLAMP BUMPERS

Designed specially to fit cars protected by splash aprons and having drop front spring hangers, similar to illustration shown.

Fittings consist of two separate clamps which clamp rigidly on the lower flange of the frame, and are completely covered from view by the splash apron. To these clamps a steel bar is securely bolted, this bar passing on the outside of the frame, therefore not interfering with mud or fender splash apron of almost any design.



Showing Clamps under Apron



Showing Fitting Bar Outside of Frame

This fitting will also fit the rear of many makes of cars having rear extending frames. It is the most practical type of fitting for the jobber and dealer to carry, as with this fit-

ting in stock a greater percentage of cars can be fitted than with any other type.

Cars such as the Ford, Chevrolet, Saxon, Franklin, and others of special frame construction require special fittings, which are illustrated in our catalog, a copy of which we will gladly mail you upon request. Send for prices and further description.

MANUFACTURED BY

L. P. HALLADAY COMPANY, Streator, Illinois, U. S. A.



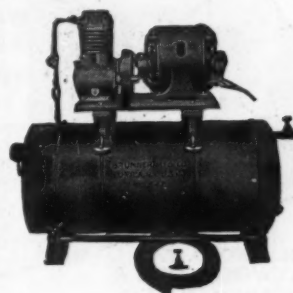
"The Motorist who is Brunnerwise knows Brunner Service Satisfies"



He knows because he has always found Brunner Service thoroughly dependable, and for that reason he recognizes the Brunner Sign as a sure sign of high class, unfailing service—that is why thousands of Brunnerwise Motorists patronize the garages displaying the Brunner Sign—the service satisfies.

THE BRUNNER AIR COMPRESSOR WAS DESIGNED FOR THE GARAGEMAN'S SPECIAL USE AND HAS BEEN CONSISTENTLY MAKING GOOD IN THE GARAGE EVER SINCE THE GARAGE BUSINESS HAS BEEN A BUSINESS.

Built in the largest and best equipped plant in the world, devoted to the exclusive manufacture of garage air compressors. No special mechanical attachments necessary to help the motor carry the load—no restriction of the lubrication to invite disaster—no wild claims of impossible results but simply the same good substantial business proposition it has always proven for the garageman who buys it.



Write for No. 15 Catalogue and name of Brunner Jobber who covers your town

Brunner Manufacturing Company

Main Office and Plant
Utica, N. Y.

Cincinnati Branch
Cincinnati, Ohio

"Full of Carbon Full of Trouble"

—Doc. O'Kleen



Carbon nuisance is unnecessary. Besides the expense of cleaning it out, down goes the efficiency of your motor, and trouble begins.

Convert Carbon Into Power with **ECON-O-KLEEN**

Gasoline consists of six parts carbon and one part hydrogen. Pure gasoline burns clean. But who gets pure gasoline!

Econ-O-Kleen turns present day gasoline into perfect fuel. It introduces enough extra oxygen into the gasoline to consume every particle of carbon in the cylinders when the explosion occurs; also enough extra oxygen to burn all the carbon already deposited.

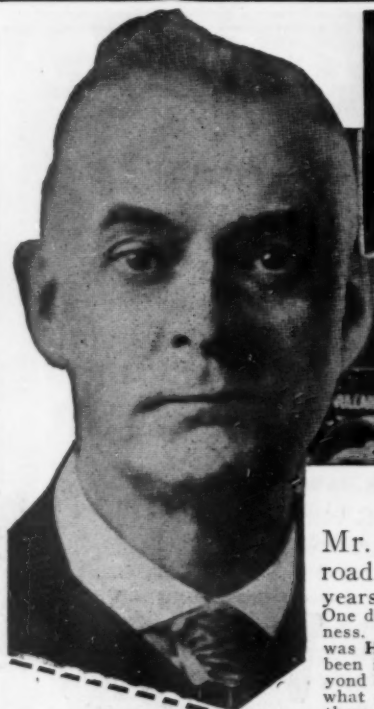
Guaranteed—to add to motoring pleasures—to clean out and prevent carbon—to increase power and gasoline mileage from 15% to 30%—to be free from acids and all other elements which can possibly injure a motor.

Send \$1.00 for a trial can, prepaid, enough to treat 112 gallons of gasoline. Put what you save into Thrift Stamps. Your money back if you are not pleased. Get our free book, "Carbon," tells how to save repairs.



Dealers and Jobbers. Get in line quick! Econ-O-Kleen is a red-hot seller—and a REPEATER!

Econ-O-Kleen Fuel Co. 104 Labree Avenue, Thief River Falls, Minnesota



I EARNED \$220,000 IN FOUR MONTHS

This Is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. During all those twenty years, he drew the customary monthly salary of a telegraph operator—no more—no less. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Repair Business. In a few weeks he had purchased and installed a Haywood outfit, and was doing business for himself. He was **His Own Boss**. A short time ago he wrote us that his income in four months was as much as it had been in Two and One-Half Years as Telegraph Operator. You men who have been left at home—who are beyond the draft age, can and must take up the burdens left behind by others. Oldham is a living example of what can be done. I have 500 places to be filled now. 500 stations where tire repairing is neglected, because there is no one to do it.

**M. HAYWOOD, Pres.
HAYWOOD TIRE &
EQUIPMENT CO.**
501 Capitol Avenue, Indianapolis, Ind.

Dear Sir: Please send me your book on Haywood Tire Repair Plants and full particulars on your National Tire Repair Service and details of your FREE school of tire repairing.

Name

Address

I Must Have 500 Men to fill these places within the next sixty days

I have a big interesting book to send you—a book about tires—it explains this business—gives inside figures and profit. Gives actual proof of success—letters of others who are now operating Haywood Shops and making big money. What these men have done you can do. \$2,500 to \$4,000 a year is conservative. One machine will give you a start. You can see business all around you—everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a shop—put out a Haywood sign, and auto owners will come to you and the service you bring them.

Sign the coupon and mail it today, or send a post card or letter.

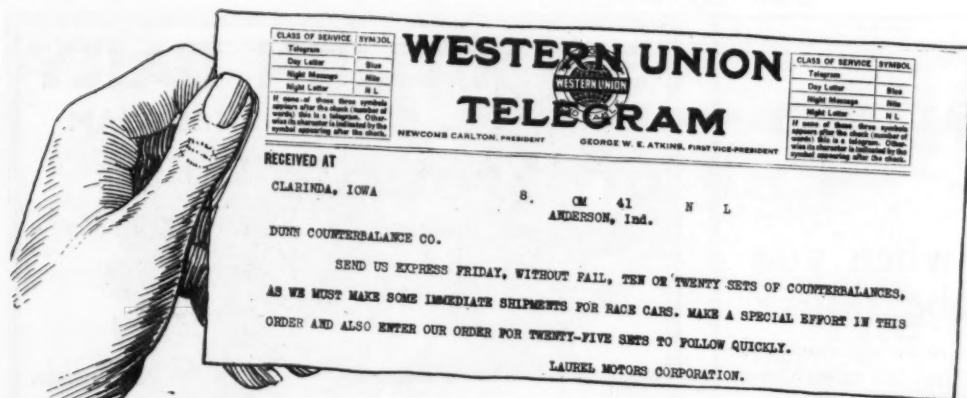
HAYWOOD TIRE & EQUIPMENT CO.

M. HAYWOOD, President

501 Capitol Avenue, INDIANAPOLIS



When Writing to Advertisers, Please Mention Motor Age



Orders Like This Have Made Our Business an Established Success

This is just one illustration of why our business has steadily grown from a small beginning into a well established, flourishing industry. Dealers and consumers alike were quick to see

the merits of Dunn's Counterbalances—quick to take advantage of a proposition that brought immediate results.

Our proposition was not the "flash in the pan" kind. It required a reasonable time to become established on a foundation of confidence—confidence from our dealers and users alike.

DUNN'S COUNTERBALANCES FOR FORDS

Mean More Power—More Speed—More Economy

are based on a scientific engineering principle. When attached to a Ford engine they produce a perfectly balanced crankshaft which in turn means an enormous reduction in vibration. Vibration in the motor will reduce power and speed because vibration is nothing more or less than lost motion or power. Reduce vibration and you automatically increase power and speed. By using a special wrench included free with each set, the time of installation is cut down to less than an hour.

DEALERS!—We are receiving many orders direct that should be yours. The profits on these orders would be mighty pleasing to you. We can fill orders immediately. Wire or write today for our proposition. (Mail orders filled—where we are not represented—when accompanied by cash or specified C. O. D.)

DUNN COUNTERBALANCE COMPANY

Dept. 1, CLARINDA, IOWA

Western Representative: DUNN COUNTERBALANCE SALES CO., 1220 San Pedro St., LOS ANGELES, CAL.

PRICE
COMPLETE
ONLY
\$12

If your
dealer can-
not supply
you, order
from us di-
rect, giving
your dealer's
name.

The ROSE GREASE GUNS Make a HIT Every Time

First in War
Used by the U.S. Army and Navy
First in Peace
Backed by an Army of Satisfied Users

Distributed by Most Jobbers & Dealers

MADE IN THREE SIZES

The Rose Auto Gun for the individual car owner....Price \$1.80
The Rose Universal Gun for the car, truck and tractor....Price \$2.50
The Rose Shop Gun for the garage and repair shop....Price \$3.50

J. H. HANEY & COMPANY HASTINGS, NEB.

MANUFACTURERS:
ROSE TIRE PUMPS and ROSE GREASE GUNS

When Writing to Advertisers, Please Mention Motor Age



What will you do when you can't get new ball bearings?

The Government is gradually absorbing the entire output of steel and the output of manufacturers of new Ball Bearings. What will you do when you can't get any more of them—

Buy Ahlberg Remade Bearings

But why not put off the day when you can't buy new Ball Bearings by saving the steel and having your worn bearings reground **now**.

Ahlberg remade bearings are equal and guaranteed the same as new. The steel in them is better than the steel being turned out under war-time stress—they will give you better service for less money. Write us now for particulars.

FOR QUICKEST SERVICE SEE OUR NEAREST BRANCH

Los Angeles, 325 W. Pico St.
Boston, 93 Massachusetts Ave.
Detroit, 790 Woodward Ave.
Minneapolis, 926 Marquette Ave.
San Francisco, 1116 Polk St.

Cleveland, 1836 Euclid Ave.
New York, 1790 Broadway
Atlanta, 323 Peachtree St.
St. Louis, 2831 Locust St.
Portland, 325 Davis St.

Philadelphia, 934 No. Broad Street

Ahlberg Bearing Company
2636 Michigan Avenue Chicago, Illinois



Ohio Karbon Killer

Keeps Spark Plugs, Valves, Pistons and Cylinders free from carbon—all the time.

Don't let your engine choke up with carbon until it can't run, and then remove it—**Prevent it!**

Put Ohio Karbon Killer in your gasoline, and prevent the formation of carbon, thus keeping your engine in the very best condition at all times.

Costs \$1.00 per lb., and a pound treats 480 gallons of gas. Get a can right now, and give your engine a chance. If your dealer cannot supply you, send your dollar to

THE OHIO GREASE COMPANY
Box 121, LOUDONVILLE, OHIO

30 MILLION DAILY

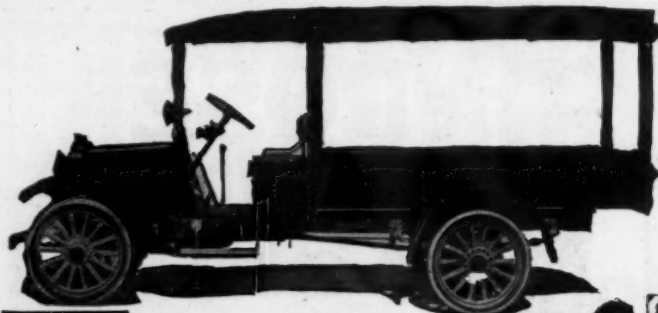
BACK OF UNCLE SAM



IN the production of Hoover Steel Balls more than 500 tons of steel is consumed monthly, which, in the terms of 1/4-inch balls, approximates 30,000,000 balls daily, or 10,950,000,000 annually.

That's the stupendous measure of the Hoover organization's contribution to the industrial life of America—a backing up of the nation's whirling war machinery with a mechanical product, indispensable to rapid, economic efficiency.

Hoover Steel Ball Company
Ann Arbor, Mich., U. S. A.



Commer

A Year Ahead of Other Trucks

The only truck having everything necessary on it—when you buy it

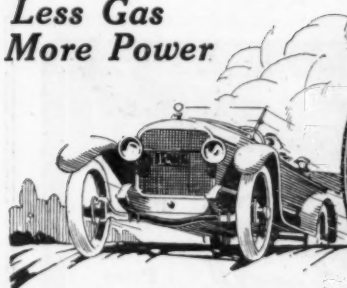
Three types of bodies for all models—Bijur Starting and Lighting System, with Dixie Magneto Ignition—Stewart Vacuum System—Pierce Governor—Windshield—Bumper. Continental Motor (3 1/2 xs)—Torbenson Rear Axle—Detroit Steel Products Company Springs.

One-ton Chassis.....	\$1340
With Express Body.....	1375
With Post Top and Storm Curtains.....	1450
With Standard Stake Body.....	1490

THE COMMERCE MOTOR CAR COMPANY
DETROIT, MICH.

W. H. Brinkerhoff, Eastern Dist. Mgr.
Belmont Ave., Elmhurst, Long Island, N. Y.

**Less Gas
More Power**



**ADELITE
MOTOR
CARBON
REMOVER**

Low Test Gasoline This Season Increases Carbon

THIS season's fuel is unusually low grade. That means increased carbon. Motor knocks—kicks—power loss, or heavy gas and oil consumption, point to one thing—carbon! Get rid of carbon at once with Ad-El-Ite Motor Carbon Remover. Makes motor run like new. Increases power and speed. Saves 12½% to 25% gas and oil. **No Lay-up.** Harmless to metals.

Ask your dealer.

Send 25c for helpful book "Auto Troubles Cured," or free with a purchase of any of our full line of Ad-El-Ite auto, paint and varnish specialties.

Dept. C-6

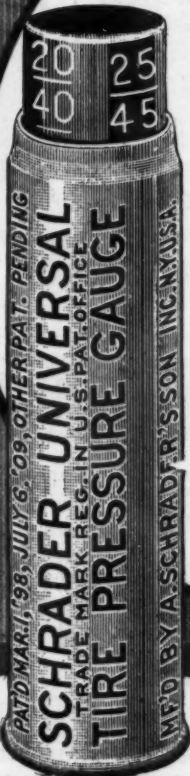
ADAMS & ELTING CO.

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BROOKLYN TORONTO

SPECIAL

Enough Ad-El-Ite Motor Carbon Remover to thoroughly clean two or more cars will be sent prepaid anywhere in the U. S. for \$1.25.

*Air is Cheap
Use Plenty of It*



Air pressure not only affects the duration of your tires, it also has a very direct bearing on how many miles per gallon your gasoline will give you. When your tires are under-inflated it takes more gasoline to drag them along the road—sometimes as much as 25% more. Measure your air pressure with a

Schrader
UNIVERSAL
TIRE PRESSURE
GAUGE

and save not only your tires but your gas.

A. Schrader's Son, Inc.

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CHICAGO

\$1.25



The Most Remarkable Top Material Yet Produced

There is one thing about DRIDEK. It is always just the same! Every piece—every yard—has that same perfect finish that will not scratch or blister.

When you want a fine, snappy top; or attractive, soft upholstery—buy a car that is trimmed with DRIDEK. Absolutely waterproof, and will not scratch or blister.

DRIDEK Tops turn out well, and are a source of continuous satisfaction to the car owner.

Send to Dept. C
for Samples and
prices of DRIDEK

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Selden Trucks

Light Delivery, 1, 2, 3½ and 5-Ton

Write for full information on the Selden Line



DEALERS: Write or wire for desirable territory

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Rochester, N. Y., U. S. A.

A 1-INCH FIRING SURFACE

Greater Power
Quicker Acceleration
Less Carbon

10% to 20% More Mileage
Price \$1 Each

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"PUT THE BLAME ON THE MAN BEHIND"

COMER AUTO STOP SIGNAL

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If your dealer does not handle send in his name or order direct.

Dealers, write for special proposition

THE WONDER SALES CO.

616-617 HIPPODROME BUILDING

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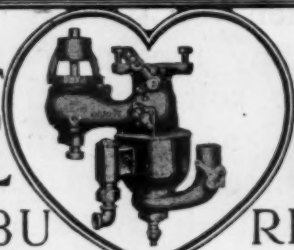
YOUR battery contains lead plates, acid and distilled water. Your plates and acid will last for the life of your battery if you will add distilled water frequently to offset evaporation.

USL Service Stations will gladly test your battery and add distilled water without charge



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SCHAEBLER
CARBURETOR



"The Heart of the Automobile"

THE WHEELER-SCHAEBLER CARBURETOR CO. Inc.
INDIANAPOLIS • INDIANA

Guaranteed for 10,000 Miles Bricton Pneumatic Tires

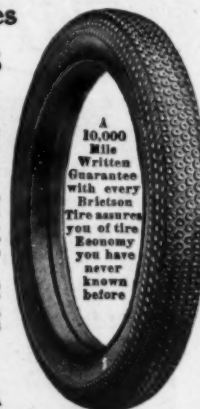
Every Bricton Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser. Bricton Tires are Puncture-Proof, and proof against blowouts, skidding, ruts, rim-cuts, oil and gasoline. Wonderful resiliency, easy riding qualities and economy commend them to every car owner.

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FREE TRIAL OFFER—To convince you Bricton Tires will give you satisfaction you may try them on your car at our expense. Write today for this Free Trial Offer, a copy of our guarantee and full information about Bricton Tires and Treads.

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TRADE MARK REGISTERED IN
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UNITED STATES PATENT OFFICE

protects Transmission Gears and works into Shaft Bearings.
Here is an important point that many car owners overlook.
Ordinary grease not only gives indifferent lubrication to transmission gears themselves, but it does not work out into the shaft bearings. NON-FLUID OIL cushions gears perfectly and works out into shaft bearings and keeps them well lubricated.
Use "KOO special" grade of NON-FLUID OIL in your transmission case and for oil tight rear axles. Use "KOOO" for bearings.
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SPEED-DASH-CLASS

Own a lively, snappy looking PACO RACER. Modeled on French streamline design. Fits any Ford Chassis.
PACO BODIES are patented. None others like them. Strong molded steel body. Low hung, they cling to the road. Comfortable seats and easy riding. Shipped complete with all attachments.

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The More-Lite Lens gives you everything you want in the way of driving light and safety.

It is a lens of high efficiency, but clearly within the headlight laws of all states—the easiest selling lens in the United States. Write for our dealer proposition.



LIST PRICES

Inches	Per Pair
6 to 8½ dia.....	\$1.50
8¾ to 9½ dia....	1.75
9¾ to 10¼ dia....	2.00
10½ to 11¼ dia...	2.25

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The oldest weekly journal in the field.

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THE LIBERTY PLANE RADIATOR ORNAMENT



The most attractive and most popular Radiator Ornament ever produced. Fits any car, indestructible, solid aluminum, highly polished, wings hand-painted with flying emblem in red, white and blue. The slightest motion spins propeller arm, and makes it almost seem alive. "It fairly hums with patriotism."

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For Transmissions
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Ever-Lastin will not run in hottest weather—will not freeze in coldest weather—sticks to metal under the worst strains and pressure—preventing wear and assuring perfect lubrication.

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FREE TO DEALERS With first order for half or full barrel of Ever-Lastin, we will send a self measuring 20-lb. grease cabinet free—pumps ¼-lb. to the stroke.

You will find Ever-Lastin a big money maker—write us today for prices and full particulars.

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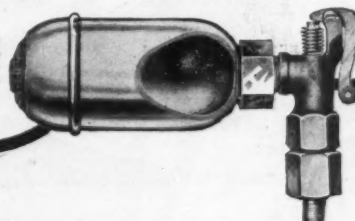
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BUELL EXPLOSION WHISTLE

Solves the problem. Here is a signal that never fails because it operates with the full explosion pressure of the engine back of it. It is a whistle—not a horn—and its powerful note commands attention anywhere and everywhere. It is simple in construction, yet so sturdy that we guarantee it for 10 years, and further proof of Buell merit is its adoption as standard or optional equipment on such cars as Pierce-Arrow, White, Columbia, Le Moon, Lamson and 24 others. Made in two models: \$4.25 Single Tone, \$6.00 Chime. At your dealer or sent direct.

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CRYSTALLIZED PLATE STORAGE BATTERY

Century batteries are built and sold for replacement only. They are standardized batteries with Universal Terminals. 6-V. 80-Amp. (square), 6-V. 80-Amp. (long), 12-V. 40-Amp. Just 3!! Think of it! Three! They replace 51 shapes and sizes and combinations of other makes of batteries and make 95% of all replacements.

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Standardizing means cheaper manufacturing.

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GOOD TIRES AT CUT RATE PRICES

High grade, firsts—not seconds, not blemished or rejected tires, but good tires; tires that will bring every user back for more. Sold without guarantee.

At these prices are the biggest bargains you ever purchased in your life—Think of it!

PRICES TO DEALERS:

Non-Skid	Tubes	Non-Skid	Tubes
30x3.....	\$ 9.50	32x4.....	\$18.95
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Write now for dealers' proposition, or better yet, rush in a trial order with Chicago or New York draft, express or P. O. money order. If you prefer, send 20% of amount with your order and we'll ship goods C. O. D., subject to examination. Investigate this now. Let us tell you how we can do it.

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AND BREAKAGE

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HIGGINS QUALITY SPRINGS for Replacement

Guaranteed alike at all points. Made without center bolt or hump. Possess resiliency that protects car. Sturdy strength that gives longest wear. Safest to order for own use. Most certain to satisfy customers.

Splendid discounts to dealers. Immense demand.

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HOT SHOT MANIFOLD for Ford Cars

The intake and exhaust manifold is cast in one piece with a thin wall separating them. Thus

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The Hot Shot Manifold eliminates carbon and oily spark plugs; reduces engine trouble; saves 25 to 50 per cent of gasoline consumption; fully vaporizes all grades of "gas"; designed by engineers and indorsed by automotive engineers.

At the rate of 3 gallons of gasoline per day, this manifold will pay for itself every 40 days. Money will be refunded in 10 days if the Hot Shot Manifold does not come up to all claims made for it.

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CEDAR RAPIDS IOWA
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BRAKE LINING and CLUTCH DISCS

have for years been used as standard equipment by several large manufacturers of cars. Is your car "Rusco" equipped?

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The Official world's records made by the New Stromberg in gasoline mileage prove that you need the New Stromberg on your car. Mail coupon for details of how the New Stromberg will reduce your gasoline bills.

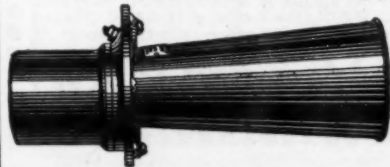
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Sparton Motor-Horns—Hand-Operated and Motor-Driven. Sparton Gasoline Vacuum Systems, Sparton Honeycomb Radiators and Sparton Radiator Fans
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*With the ex-
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Re-directs all of the diffused, blinding, useless rays down on the road where needed. Provides the essential side lighting.

Get the safe, sure, scientific lens.

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Save trouble—use joints that retain grease and require less attention. The only high grade, positively lubricated "CAN-LESS" joint made. Six sizes. For automobiles, motor trucks, tractors and other uses. Prices and full description on application.

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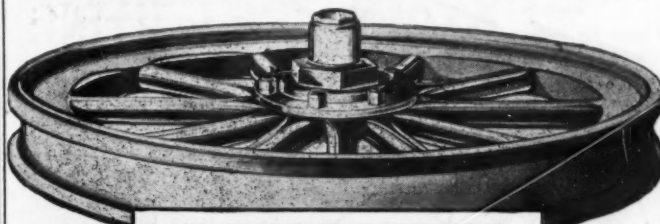
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Ask For Booklet

A Can-less Joint



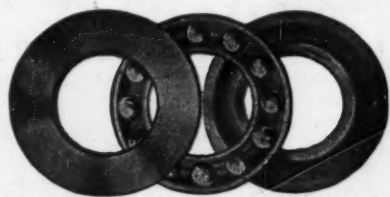
The Quickest Tire Change on Earth



**MINUTE
WHEEL**
DEMOUNTABLE

H-S

Made for Ford Cars by HILL SMITH METAL GOODS CO., Boston
Backed by H-S Trade Mark of Quality

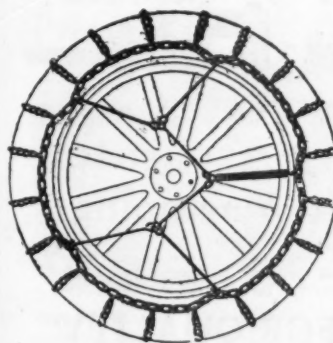


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Retainers for Cup and Cone, Thrust and Magneto Type Ball Bearings

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**Merchant's
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\$1.00 PER PAIR

Catching the chain at five points gives even tension all around. You can not lose chains and yet the chains are allowed to creep around wheels. Simple, light, neat, compact, durable—easily carried and easily applied.
Can be used on any tire.
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STARTING-LIGHTING SYSTEMS

THE DYNETO shows greatest efficiency in both motor and generator. Type D A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes. A car-speed of 15 to 20 M. P. H. keeps batteries fully charged. Starter always sure to start. Lamps always bright. Send drawings and specifications for our recommendation.

Special Outfits for Fords

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Absolutely Accurate Crankshaft Machining

20 years' experience. New Machinery of the latest design. Highest quality work and prompt delivery guaranteed. Ample capacity for large orders.

"MOLTRUP FOR QUALITY"

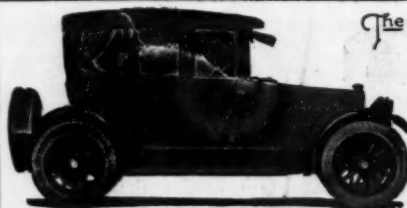
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ELIMINATE ALL PISTON RING TROUBLES

THE RING COMPANY
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The New
KISSELKAR
4 Passenger
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The ALL-YEAR Top is entirely removable—or all side windows can be lowered or raised—an exclusive Kissel feature. Mounted on the HUNDRED POINT SIX, the car of a Hundred Quality Features, with the new Kissel-built power plant. Inspect it today.

Dealers: Write, wire or phone us today for agency openings.

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EVERY INCH A CAR

HELCO No. 2

Steering Control and Locking Unit
is a Business Winner

Prevents Theft

High grade padlock locks steering gear in place. Cannot be driven or towed away.

Sells Fast

Motorists recognize the advantages of HELCO No. 2, and want it on their cars. 4000 now in use. Write for discounts and details. Price \$5. West of Mississippi, \$5.50. With padlock, \$1 extra.

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Prevents Accidents

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Better transmission and steadier tread mean longer tire mileage and less fuel consumption.



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The most practical machine for any type of motor. SIMPLE, SPEEDY, ACCURATE and RELIABLE for hand or power. No shop complete without one. In daily use in all parts of U. S. A. and foreign countries. Shortage of new cars makes it indispensable in large and small shops.

We furnish machines of varied capacities from 2½ in. up. Also special Ford Machine. For sale by leading jobbers. Oversize pistons for all makes of motors.

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MAKE YOUR OLD TIRES GO TO WORK AGAIN

Send along your old casings. From two old tires, by our special double-tread process, we will turn you out one tire ready for the road.

It makes no difference whether they are sand-blistered, punctured, rim cut or blown out.

McDANIEL WILL REJUVENATE THEM!

Tires received are examined and repaired by experts, the weaker one is telescoped over the stronger, the bead removed and locked firmly in place by the Special McDaniel Double Tread Process which adds new service.

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	If You furnish 2	If You furnish 1	If You furnish Both	Special Gray Tubes
SIZE	Casings	Casings	Casings	Tubes
30x8	\$3.25	\$5.00	\$6.75	\$1.90
30x3½	4.00	6.00	7.25	2.40
32x3½	4.25	7.25	9.00	2.55
31x4	4.50	7.75	9.50	3.10
32x4	4.75	8.00	10.00	3.20
33x4	5.25	8.25	10.25	3.30
34x4	5.50	8.50	10.50	3.40
36x4	5.75	8.75	11.00	3.50
34x4½	5.75	9.00	11.50	4.10
35x4½	5.75	9.25	12.00	4.25
36x4½	6.00	9.50	12.50	4.35
35x6	6.25	10.50	13.50	5.00
37x6	6.50	11.50	15.00	5.40



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FOR TRUCKS AND TRACTORS

Are the Product of the World's Largest Organization Devoted to the Building of Truck and Tractor Motors Exclusively.

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Delivery Problems Are Solved by
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2,
3½
and
5
TON

Prompt deliveries of all capacities. Quality, price and demand insure good business. Write for our proposition.
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Out Go the Lights—
All of a sudden—without warning—very likely at the worst part of the road! Don't guess at the condition of your electrical equipment. Put a




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MODEL 354 AMMETER

On Your Dashboard or Cowl

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23 Branch Offices in the Larger Cities

MODEL 302
Price \$25.00



This Is Our STANDARD
Garage Test Set

Easy to understand and operate. It enables your mechanic to stop guessing and to locate all troubles quickly.

Dodge Bros., Buick, Cadillac, Hudson, Cole, Overland, Nash, Chalmers, King, Chevrolet and Delco Light have used thousands of them.

WRITE TODAY FOR FREE CATALOGUE COVERING OUR LINE OF INSTRUMENTS AND PUBLICATIONS

PHILLIPS ENGINEERING CO., Dayton, Ohio

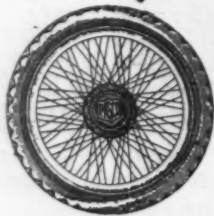
KINGSTON
CARBURETOR

Save Money by Economizing Gasoline

Four floating bronze ball valves opening automatically under different motor suction supply a uniform mixture at any speed regardless of hot, cold, wet or dry weather. Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment.

MADE BY THE OLDEST MANUFACTURERS OF CARBURETORS IN AMERICA
ESTABLISHED 1895
BYRNE, KINGSTON & COMPANY, Kokomo, Ind.

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are best because of three exclusive patented features—

1. A tangent method of spoke lacing giving a stronger web.
2. The hub cap made of an indestructible metal—unaffected by jams and collisions.
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Pasco means Strength, Safety, Economy and Distinctive Beauty.

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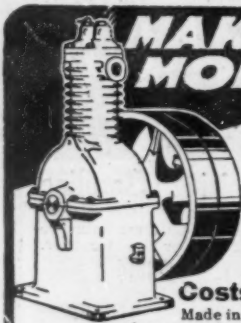


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By selling more goods—attract new trade by offering—

CURTIS AIR FREE FROM OIL

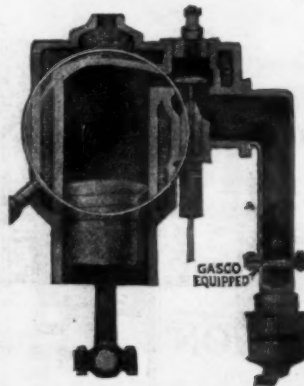
Free From Oil means fewer punctures, increased mileage and less repairs. The Curtis Air Compressor is the only one that can't flood the cylinder with oil, because of exclusive mechanical safeguards.

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Made in 5 sizes and 125 combinations. Costs no more than any other kind.

Write for our generous offer and full particulars, or ask your jobber for prices—but be sure and call it by name—Curtis—to avoid substitution.

CURTIS PNEUMATIC MACH. CO. 15274 Kienlen Ave., St. Louis, Mo.
Branch Office: 830-H Hudson Terminal, New York



You Can't Waste Gas

You can't afford to waste gasoline these days—not merely because of the rising cost per gallon—but for patriotic reasons—to help get the greatest possible service out of the supply. The best way to save gasoline is to use a

GASCO
GASOLINE ECONOMIZER

It vaporizes your gas mixture completely and this insures your getting all the power there is out of the last drop of gasoline.

Send us a dollar with description of car, carburetor and intake manifold flange—we will send you a Gasco—with a money refund guarantee.

GASKET SUPPLY COMPANY
1727 Ludlow St., Philadelphia, Pa.

Elgin Six

Chicago-Built Motor Cars

5-Passenger Touring **\$1,165** 4-Passenger Roadster

All-Weather Sedan **\$1,645**

Military Scout Model **\$1,245**

Every Elgin Six Combines Distinction, Endurance, Economy and Comfort

Elgin Motor Car Corporation, 2427 South Michigan Blvd. Chicago, Ill.

ANDERSON AUTOREELITE

Makes Tire Changing as Easy by Night as by Day

More than just a Spotlight.



ANDERSON ELECTRIC SPECIALTY CO.
118-124 S. Clinton St. Chicago, Ill.

BURD
High Compression
PISTON RINGS

"The Accepted Standard"

BURD HIGH COMPRESSION RING CO.
ROCKFORD, ILLINOIS

Sales Offices in All Principal Cities.

Steel Tires & Mud Chains

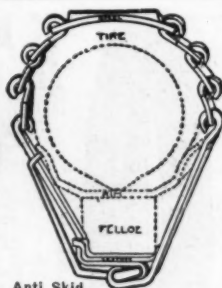


Old Tires
Covered
Complete

Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

Special Prices to Those in New Territory

Kimball Tire Case Co., 173 Broadway



Anti Skid

Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

Council Bluffs, Ia.

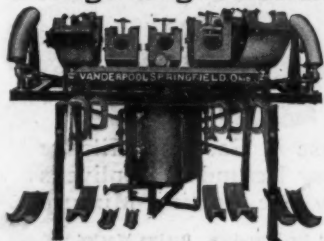
Winton Six

For eleven consecutive years the Winton Company has specialized on one type of motor car exclusively—the six-cylinder. Hence, the Winton Six is a mechanical triumph. Best of all, every Winton Six is finished to meet the purchaser's individual taste. Your Winton Six will be exactly as you desire it, a distinctly personal possession.

Write for Catalog

THE WINTON COMPANY
424 Berea Road, Cleveland, Ohio, U. S. A.

Vulcanizing With a VANDERPOOL VULCANIZER Brings Big Profits



Right now is the time to install this Vanderpool 5 Cavity Vulcanizer. Tires have advanced and will go higher, due to restricted importation of raw rubber. Car owners must conserve their tires and have them repaired and get out all the extra mileage possible by retreading and general repairing. This plant is our big seller because it does all the tire work that comes to the repair man. You can become the leading tire repair works in your vicinity with this Vanderpool 5 Cavity plant. Make a specialty of retreading with 1/3 circle air bags and you will soon have more than you can do.

Send for our Descriptive Folder and Price List

VANDERPOOL CO., Box M. A. Springfield, O.

BOSCH

AMERICA'S SUPREME IGNITION SYSTEM

NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO
WORKS AND FOUNDRIES: SPRINGFIELD, MASS.



Price
only
\$1.50

THE NEW UTILITY Universal Rim Wrench

Now Belongs in Every Tool Box and Every Garage

Automatically fits every nut used in connection with demountable rims on all makes of cars. Now beautifully finished in nickel and black enamel. More compact and lighter. Improved throughout. Selling on sight. Complete only \$1.50.

Write for complete details
Dealers, ask for liberal discounts
THIS NEW WRENCH SELLS

HILL PUMP VALVE CO.

Archer Ave. and Canal St., Chicago

Eastern Sales Office: 149 Church St., New York City.
Western Sales Office: 149 New Montgomery St., San Francisco, Cal.

Mfrs. of Famous UTILITY PROTECTED HEATERS for all Motor Cars.

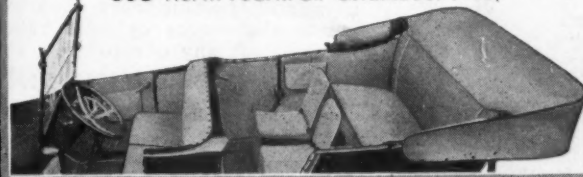
"EASY ON"
SEAT COVERS
TIRE COVERS
TOP RECOVERINGS

GORDON
EASY-ON SEAT COVERS
TAILORED TO FIT

WE HAVE
PATTERNS FOR
MORE THAN A
THOUSAND MODELS
OF CARS.

Sold by leading Jobbers and Dealers everywhere
Write for Sample Book and Price List

The J. P. GORDON CO.
308 North Fourth St. Columbus, Ohio.



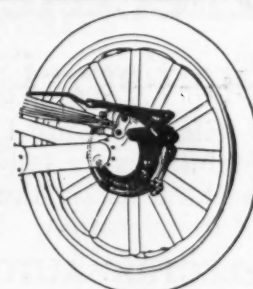
MR. DEALER

This morning's mail (April 8th) brought in repeat orders from Dealers for 109 sets PLA-SAFE Emergency Brakes.

These dealers were not influenced to place these orders by clever salesmen or glaring advertisements, but have found that our Brake has merit, and when a few sets are placed on owners' cars, that an instant demand results.

Why not write us today for our Disc. and Big Selling Plan?

PLA-SAFE COMPANY
Successors to L. A. Leathers Co.
BROOKVILLE PENNSYLVANIA



Retail Price **\$10** Set

GEARLESS
DETROIT
CRANK-SHAFT
Tire Pump
Pat. Aug. 25, 1915

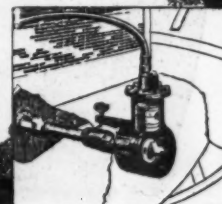
Attached
Instantly

Without Tools or Adjustments

—on any of 960,000 Briscoe, Dodge, Chandler, Hudson, Overland, Reo, Stearns, Saxon 1916 and Studebaker cars. Not a rubber diaphragm device. Write for details. Dealers, ask for discounts.

Price **\$12.00**

DETROIT ACCESSORIES CORP'N
520 Hillger Ave. Detroit, Mich.
Canadian Distributors: Walkerville
Hardware Co., Walkerville, Ontario



THE B & D PORTABLE



The big advantage of this drill lies in the fact that you do not have to let go with either hand in order to stop it when the bit breaks through.

You just pull the trigger and cut off the current.

The steadiest, most satisfactory and economical hand drill ever made.

Universal Motor (any current), ball thrust bearings, Chrome vanadium steel gears, forced draft cooling system. Fully guaranteed.

Write for full description

THE BLACK & DECKER MFG. CO.
111 Pratt Street, Baltimore, Md.

Canadian Distributors

Sales Representatives in England



KIMBALL TIRES

Are Doubling Profits for Some Dealers

Write for Our Interesting Offer

Write and ask us how we do it. They are positively not seconds, but first-class fresh casings. The following are dealers' prices:

Non-Skid Tubes		Non-Skid Tubes	
30x3	\$ 8.75	\$1.90	\$2x4.....\$16.45
30x3 1/2	10.95	2.15	\$3x4.....17.55
\$2x3 1/2	12.45	2.25	\$4x4.....18.25
			3.20

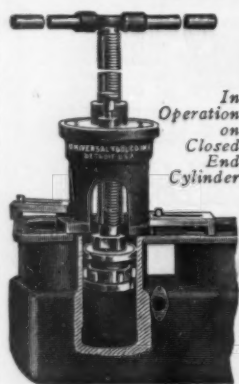
Prices on Other Sizes in Proportion

Send us your order today, accompanied by cashier's draft on Chicago or New York, or money order. Large and small orders given immediate attention. These tires are sold without a guarantee. Write today for territory. Prices will be advanced shortly. Place your order now.

This
"Straight Side"
Type Is Made Also
Clincher Type

Kimball
TIRE & RUBBER CO.

Incorporated
1469 Michigan Av.
CHICAGO



The New Improved Universal Cylinder Reboring Tool Is Mistake Proof

As simple in design as it is effective in action. Construction insures an absolutely rigid tool, with perfect centering device. Other new and revolutionary improvements that make cylinder reboring easy for any one to do.

Range of Expansion 2 1/2" - 5 1/16"

Write for free illustrated literature with complete details. Give Jobber's name.

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DETROIT 918 Beaubien St. MICHIGAN

PHILBRIN DUPLUX IGNITION

—with a second system to
spur the motor to super-service

COMBINES two separate and distinct systems in one—a Single Spark System, most economical of gas and offering vastly increased power. A Secondary or High Frequency System which delivers to each cylinder a stream of a thousand sparks a second—overcomes abnormal conditions, such as foul spark plugs, poor fuel, poor carburetion, and cold cylinders—offers 100 % Assurance against ignition failure. Easy to install, moderate in price. Descriptive catalogues and our special sales proposition on request.

PHILIPS-BRINTON COMPANY
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Electric Auto-Lite Starting—Lighting—Ignition

Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

ELECTRIC AUTO-LITE CORPORATION
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HOT-PIN MANIFOLD for FORDS

Exhaust and Pins Assure Uniform Heat Treatment of All Fuel | This Hot-Pin Chamber Breaks Up All the Fuel | Exhaust Gases Heat the Pin Chamber On All Sides



40% to 50% Increase in Gasoline Mileage
Guaranteed or Money Refunded. Enlivens
Low-Grade Fuel by Pre-Heating Mixture

Price \$16.50 complete. Send for Literature. Dealers Wanted

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Keep all the rubber
under the heavy load
all the time. Equip with

Firestone
GIANT
TRUCK
TIRES



Space
are Time
Big Profits

Ask For
Catalog No. 4.

Recharging Batteries

offers garage men a bigger opportunity for profits than anything else they can do.

Our 3-G Motor Generator

charges from one to eight 6-volt batteries at one time. Anyone can operate it. Our 9-G Generator charges one to twenty-four batteries at a time.

There are over 8,000 of our vibrating type Battery Chargers in use. Write for particulars.

ST. LOUIS ELECTRICAL WORKS,
4057 Forest Park Boulevard,
St. Louis, Mo.

THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS.
ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

A WAR TIME SAVING! ON AUTO PARTS

The automobile manufacturers who, in normal times can supply new parts for the car they manufacture, are now busy working for the Government. It is almost an impossibility to get new parts, and even if you could, you would pay the list price, which is tremendous. However, the used parts concerns can supply you at a saving of from 50 to 80 per cent.

The question is: Who are you going to buy used parts from? The small, unreliable concerns or one of the largest houses in the world?

LET US FILL THAT ORDER

QUICKLY

Motors, Fully Guaranteed

Buda, 1914, 40 H. P.	\$ 90.00
Buick, Model 17, 45 H. P.	90.00
Buick, Model 19, 40 H. P.	90.00
Buick, Model 21, 40 H. P.	90.00
Buick, Model 27, 35 H. P.	75.00
Buick, Model 25, 25 H. P., 1914.	125.00
Buick, Model 10, 22 H. P.	70.00
Buick 39	100.00
Two Cadillacs, 1914, 42 H. P.	135.00
Chevrolet, 1916, S. & G.	150.00
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Cutting, Model T, 35 H. P.	65.00
Four E. M. F.'s, 1912, 30 H. P.	50.00
Everitt, 1912, 30 H. P.	50.00
Two Flanders, 1912, 3-speed.	50.00
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Northway, 1914, 40 H. P., Jesco Starter	75.00
Overland, Model 52, 35 H. P.	70.00
Overland, Model 69, 30 H. P.	70.00
Overland, Model 79, 30 H. P., Gray & Davis Starter	85.00
Overland, Model 71, 40 H. P., U. S. L. Starter	90.00
R. C. H., 1912, 25 H. P.	45.00
Regal Underslung, 1913, 30 H. P.	50.00
Stoddard-Dayton, Model 50, 50 H. P.	75.00
Stoddard-Dayton, Model 30, 30 H. P.	60.00
Studebaker, 1915, S. & G.	115.00
Studebaker 25	40.00

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Chalmers, Four-36, 1914, Air Starter.	135.00
Chalmers, Model M, 1911.	115.00
Chalmers, Model K, 1910.	110.00
Cole 6-60	175.00
Hudson, Model 33, 1912.	125.00
Ford, 1912	65.00
Ford, 1913	70.00
Ford, 1914	75.00
Northway, 1913, En Elco.	\$100.00
Marathon, 1914, Starter.	145.00
Maxwell, 1914	90.00
Hupmobile 32	110.00
Hupmobile 20	65.00
Lexington 45	110.00
Krit	85.00
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CRANKCASES

\$10.00 to \$60.00

CRANKSHAFTS

\$5.00 to \$35.00

CYLINDER BLOCKS

\$7.50 to \$35.00

RELIABLY

STARTERS— GENERATORS

\$25.00 to \$50.00

PRESTO TANKS

B. Filled\$7.50

E. Filled 6.50

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Buick 37	\$30.00
Buick 17	20.00
Buick 25	17.50
Buick 10	15.00
Buick 31	20.00
Buick 27	20.00
Buick 19	20.00
Buick M-40	22.50
Cadillac, 1911	20.00
Cadillac, 1910	20.00
Carter-car 5 A.	20.00
Cutting	17.50
Chalmers F	17.50
Chalmers K	17.50
Chalmers M	20.00
Cole 6	30.00
E. M. F.	20.00
Flanders	15.00
Hupmobile 32	20.00
Jackson	17.50
Maxwell Special	17.50
Midland	20.00
Maxwell 25	17.50
Overland 59	17.50
Overland 90	25.00
Oakland 6	25.00
Hupmobile	12.50
Overland 69	17.50
Overland 79	20.00
Overland 71	20.00
Overland 54	17.50
Paige 25	17.50
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Stoddard-Dayton 30	15.00
Stoddard-Dayton 50	20.00
Hudson 33	20.00
Krit, 1914	20.00
Chalmers 6	30.00
Velie 40	20.00
Pathfinder 12	25.00

MAGNETOS

Bosch DU-6	\$30.00
Bosch DR-6	30.00
Bosch D 6	25.00
Bosch DU-4	25.00
Bosch DR-4	25.00
Bosch D-4	22.50

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Bosch DU-4 Set Spark	20.00
Simms	\$17.50 to 30.00
Remy	7.50 to 15.00
Splitdorf	7.50 to 15.00

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Masters, any size	\$10.00 to \$15.00
Rayfield, any size	8.00 to 12.50
Stromberg, any size	7.50 to 10.00
Marvel, any size	7.50
Schebler, any size	5.00 to 7.50

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Any Make, Any Size, \$2.00 Up

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Any Make, Any Size

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Differential	2.50 to 15.00

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Timken, per set	\$2.00 to \$ 5.00
Hyatt, per set	1.00 to 3.00
New Departure, per set	2.50 to 10.00
Thrust, per set	1.00 to 2.50

WHEELS

Any Size	\$2.50
Demountable	5.00

COMPLETE PARTS FOR

Abbott-Detroit 30	Moon 1913
Apperson 36-40	Mitchell T-J-H-R & 6-191.
Auburn 1909 to 1914 inc.	National 50
Buick F 10 16-17-18-25-31-37	Oakland 24-25-33-35-40 & 42
Cadillac 1903 to 1915 inc.	Ohio
Carter Car	Oldsmobile 50 and 60
Chalmers F-K-M-J 36-&-18	Overland 37 to 79, Inc., & 82-
Cole 40-60	6 Cylinder
Columbus-Firestone	Paige 25 and 36
Columbia	Pierce-Arrow
Commerce	Rambler 34-54
Continental	Regal 30 & Underslung
Cutting 35T & 40 B	Reo 1910 to 1913 inc.
Elmore	Studebaker
E. M. F.—Studebaker 30-35-25	Spaulding
Everett 4-30	Staver Chicago
Flanders 2 and 3 speed	Stevens U X & A A Six
Foris, T.R., N. S	Stoddard 30 and 50
Franklin 6	Velie 30 & 40, 1909 to 1912,
Great Western	Inc.
Halliday	Warren-Detroit
Hudson 20-21-33-6-40	Buick Truck
Hupp 20 and 32	Oakland Light Six
Imperial 31-34	Brush
International	Colyb
Interstate 10 to 13 inc.	Croston Keeton
Jackson 23-33-35-40 & 50	Detamle
Krit 2 and 3 speed	Enger
Maxwell 25	Firestone Columbus
Marathon 1914	Lexington
Marion	Midland
Mason (Pratt 40)	Meiz
Maxwell A-B-I-E-K-G &	Michigan
Mascotte & Mercury	Winton 4 & 6
Midland	Chevrolet Baby Grand

Write, Phone or Write Today to Any of Our Branches

OUR GUARANTEE—If goods are not satisfactory return them. Money cheerfully refunded.

"THE HOUSE OF NO REGRETS"

AUTO PARTS COMPANY

INCORPORATED

TWIN CITY AUTO PARTS CO.
1213 Hennepin St., Minneapolis, Minn.

OMAHA, NEB.

AUTO PARTS CO.
211 S. 11th St., Lincoln, Neb.

When Writing to Advertisers, Please Mention Motor Age

Bargain List to Dealers for a Quick Turnover!

New and Used Parts—Supplies and Materials!!!

MOTORS (Guaranteed)

Abbott	\$ 75.00
Buick, Model 10	60.00
Buick, Model 25	90.00
Case, Model 40	75.00
Cadillac, Model 1914	150.00
E. M. F., Model 30	50.00
Flanders, Model 20	50.00
National	75.00
Packard, Model 1909	85.00
Premier 6 cylinder	100.00
Reo 1910	60.00
Mitchell 6 cylinder	75.00
Overland 42	50.00
Overland 59	60.00
Velie	75.00
Marmon	90.00
Rutenberg	125.00
Michigan 40	100.00

Used Parts

for
300
Makes &
Models of
CARS
at 1/2 to 3/4
Saving

NEW SUPPLIES (Below Market Price!)

Motor Driven Klaxet Horns, each	\$4.00
Electric Head Lights for Fords, pair	3.75
Head Lamp Doors for Fords, each .....	.65
Vulcanizer Kits, each .....	.75
3-in. Innershoes, each .....	.30
3 1/2-in. Innershoes, each .....	.34
Axle Shafts for Fords, each	1.40
Electric Side Lamps for Fords, pair	2.50
Oil Side Lamps, pair	2.75
A. Y. Hand Horns, each	2.25
Piston Rings for Fords (lap joint), each ..	.11
Piston Rings (all sizes), each .....	.30
Patches (for tube), box .....	.10
Spark Plugs (special), each .....	.25
Brake Shoes for Fords, each .....	.25
Body Polish (best), bottle .....	.45
Brake Lining, 1 1/2-in., foot36
Brake Lining, 1 3/4-in., foot38
Brake Lining, 2-in., foot41

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Wagner Starters	15.00
Autolite Generators	18.00
Taper Pins	
Lock Washers	
Cotter Keys	

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PRICES!

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Chalmers 6, 1913	\$125.00
Haynes	90.00
Hudson 6, 54	175.00
Hudson 37	150.00
Imperial	100.00
Krit	90.00
Velie	125.00

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If Not Satisfied, money
Cheerfully Refunded.

We carry a full line of New Gears for Transmission and Rear
Axles for all standard makes of cars. Prices on application!
NEW CHUMMY ROADSTER BODIES.....\$200.00

THE
ORIGINAL **AUTO PARTS CO., Inc.** of ST. LOUIS
ST. LOUIS, MISSOURI

Rapid Fire Service and Lowest Prices

ON GOOD SERVICEABLE PARTS FOR ALL CARS

If We Cannot Satisfy You, Money Cheerfully Refunded

SPECIAL MOTOR BARGAINS

All in excellent condition	
4 cyl. 1914 Mitchell	\$100.00
4 cyl. 1913 Big Mitchell	100.00
4 cyl. 1914 Mitchell starter and generator	125.00
1914 Oldsmobile (Defender model)	100.00
4 cyl. Oldsmobile (Autocrat model)	150.00
6 cyl. Thomas Motor (cast in pairs)	125.00
1911 Packard	100.00
1912 36 Pierce Arrow	125.00
New Marion Motor	100.00
4 cyl. 1914 Moon with starter	100.00
4 cyl. 1913 Buda	85.00
1913 Atlas	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat)	100.00
1914 Marmon	100.00
1915 Krit	65.00
83 Overland with starter	85.00
6 cyl. 1914 Jeffery with starter and generator	125.00
6 cyl. Everitt	85.00

UNIT POWER PLANTS

4 cyl. Continental—complete	\$100.00
4 cyl. Milwaukee—complete	100.00
1914 Lozier 6	200.00
1914 Premier with starter	150.00
4 cyl. Chalmers 30	65.00
6 cyl. Stevens-Duryea—complete	150.00
4 cyl. 1913 Abbott-Detroit with starter and generator	150.00

1914 Allen	\$115.00
1917 6 cyl. Regal	100.00
1915 6 cyl. Master Chalmers	150.00
1916 6 cyl. Chalmers 30	125.00
1914 6 cyl. Cole	135.00
1914 6 cyl. Oldsmobile	135.00
Buick 35	100.00
1916 Le Roi	85.00
Hupp 20	40.00

Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

MAGNETOS

Overhauled and Guaranteed	
DU4 Bosch Set Spark	\$18.00
DU4 Bosch Variable Spark	22.50
DU6 Bosch	27.50
DR4 Bosch	18.00
DR6 Bosch	22.50
D4 Bosch	15.00
D6 Bosch	17.50
NU4 Bosch	15.00
ZR6 Bosch	35.00
Eisemann Dual	15.00
Remy Model RL & D	7.00
Dixie Mags.	12.00
We carry in stock all magneto parts	

GENERATORS

Gray & Davis	\$15.00
Ward Leonard	12.00
Remy	18.00
Vesta	12.00
Beardon	12.00
Apple	10.00

300 new Adjustable T Bumpers, nickel or black, fit all cars except Fords.....\$4.50 each

STARTERS

Gray & Davis	\$15.00 to \$20.00
Remy	15.00
Ward-Leonard	20.00
Auto Lite, Bendix Drive	25.00
Auto Lite, Gear Drive	20.00
Wagner	25.00
Westinghouse	25.00
Delco	25.00

COILS

Bosch Type A	\$7.00
Eisemann	4.00
Spiltdorf	4.00
Simms, H. T.	12.00
Mea	10.00
Silent Starter and Generator Chains; all lengths and sizes.	

NEW HEADLIGHTS

Gray & Davis 12-in. face, two bulb type	\$5.00
Special 12-in. face, two bulb type	4.00
New steering posts	5.00

SECOND-HAND CAR DEPT.

\$150.00 to \$550.00

50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

PREST-O-LITE TANKS

B-Presto Tanks	\$5.00
E-Presto Tanks	4.00
Searchlight	3.00
fit all cars except Fords.....\$4.50 each	

SPEEDOMETER HEADS

Stewart or Warner.....\$1.50 to \$4.00

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All Styles and Makes

Stanweld	\$2.50
Punk	2.00
Reversible Firestone	2.00
Continental	2.50
All other makes	1.50

TIRES AND TUBES

We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts	\$5.00
Front Axles	\$5.00 to \$10.00
Rear Axles	15.00 to 40.00
Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings .....	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
Differential Gears .....	.60 to 10.00
Axle Shafts	2.00 to 8.00
Gasoline Tanks	1.00 to 5.00
Lamps .....	.50c to 5.00
Windshields	3.50 to 8.00
Spotlights	3.50
Stewart Vacuum Tanks	4.00
Carter Tanks	2.50

Mail Orders Shipped Same Day

Highest Prices Paid for Wrecked Cars

WARSHAWSKY & CO.,
Phone Calumet 7315

Largest Car Wreckers in the West
1915 S. State St., CHICAGO, ILL.

Parts and Repairs.

Parts and Repairs.

Parts and Repairs.

Our New Bargain List—Order Now

PLAY SAFE!

You lose nothing
through caution.

We guarantee every
part to be exactly as
represented or we will
refund your money.

Highest Banking
References

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Flanders 20	50.00
E. M. F.	50.00
Studebaker 25	50.00
Studebaker 4-15	75.00
Overland 56	75.00
Overland 69	75.00
Overland 6, Continental	100.00
Peerless 45 H. P.	50.00
Partin Palmer	50.00
Firestone Columbus	60.00
Mitchell 4-40	75.00
Stoddard Dayton 30	60.00
Stoddard Dayton 45	75.00
Case 1911	75.00
Cadillac 1911	75.00
Cadillac 1912	75.00
Kissell 40	75.00
American 30	75.00
Moon 1912	75.00
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31 x 4	14.50	2.80	6.75	1.65 6.95
32 x 4	14.30	2.90	7.00	1.60 7.15
33 x 4	15.90	3.35	7.75	1.70 7.80
34 x 4	16.10	3.50	8.25	1.70 8.00
34 x 4 1/2	20.65	3.80	8.50	1.75 9.65
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31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
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Ward-Leonard Generators, \$8.00 each. Ford Engine Air Pump, \$3.00 each. Bosch Magnets, 4 & 6 cylinder, \$10.00. Ford Master Vibrators, \$2.65. Presto Tanks, \$5.00. Charging Sets, \$30.00 each & up. Motor-Driven Air Compressors, \$35.00. Auto Motors, 4-cylinder Water Cooled, \$30.00. Buick, Hupp, Franklin, Continental and Buick Motors, all sizes, types and prices. Guaranteed. Write for new bargain bulletin.

JOHNSTON, West End, Pittsburgh, Pa.

AUTO PARTS

Why pay full price when we can save you, on slightly used parts

50 Per Cent to 75 Per Cent

Solid Tires and Wheels, usable for Trucks and Trailers.

Prices reasonable. MOTORS—\$40 to \$100. Write for specifications.

PRISCOL AUTO PARTS CO.

266 Grand River Avenue Detroit, Michigan

SPEEDSTER BODIES

For FORDS—Something New and Different

The new ROYAL RADIATOR SHELLS and HOODS

change your old Ford into a 1918-looking model.

Special SPEEDSTER BODIES, HOODS, FENDERS,

RADIATORS, made to order

ROYAL AUTO SHEET METAL WORKS

1464 S. Wabash Ave. Dept. A. Chicago, Ill.

PISTON RINGS

ONE PIECE DOUBLE STEP CUT

(Self Compensating Joint)

These rings assure increased power and save

gas. All sizes in stock.

GEORGE H. BLETTNER CO.

1401 Jackson Boulevard Chicago, Illinois.

Krit Owners

We furnish quick service on all engines, clutch, transmission, differential, front and rear axle, steering gear, wheels, steering knuckles and cones, fenders, frames and body parts—from original Krit stock. For all models from 1900-15, inc.

MOTOR CORPORATION

1309 Race Street Philadelphia, Pa.

Parts and Repairs. Rebuilding and Repairing.

STODDARD DAYTON PARTS

PAIGE-DETROIT

Rear Axle Bevel Gears and Pinions
These Are All New parts**THE DAYTON AUTO PARTS CO.**357 West 52nd Street 1623A McGee Street
New York City Kansas City, Mo.**SPEED SPECIALTIES—FORD**Underslung parts for Fords, complete
with instructions, per set.....\$20.00
Counterbalances for the Ford crankshaft,
per set 12.00
Speedway racing bodies.....129.50
3 to 1 gears, 2½ to 1, set..... 15.00CRAIG-HUNT, Inc. Indianapolis
835 Lemcke Bldg.**AUTO PARTS**Before purchasing parts, write for our prices
We have parts for any carSULTAN AUTO PARTS AND RADIATOR CO.
220 Grand River Ave. Detroit, Mich.**Cylinders
Reground**Over 800 Piston Patterns Always
in Stock.Our Expert Mechanics and our Highest
Grade Equipment are your guarantee
for highest class workmanship.Our Special Light Alloy Pistons will
give you More Power—More Speed;
we also do Gear Cutting of Spur and
Bevel Gears.

Write to Us Today

Auto Engine Works
St. Paul, Minn.**CYLINDERS
REGROUND**Sixteen years' experience in cylin-
der regrounding enables us to offer
you the highest grade of workman-
ship at reasonable prices.**\$5.00 to \$10.00**

Per cylinder, including pistons and rings

\$12 Special Ford JobMANUFACTURERS OF PISTONS
AND RINGS**Crown Machine Shop**

CROWN POINT INDIANA

CYLINDERS REBOREDby our Expert Mechanics are PERFECT
New Pistons and Rings fitted. Complete job
from \$4.50 to \$9.50.

SEND YOUR WORK TO OTTUMWA

STAR AUTO & SUPPLY CO.

411 Church St. Ottumwa, Ia.

Rebuilding and Repairing.

**Cylinder
Grinding**on special highest grade cylinder
grinding machinery. No make-
shift tools. Work handled by
men with automobile factory ex-
perience. Large assortment of
patterns for iron pistons. Com-
plete stock of piston rings.
Prompt service. Highest grade
work only, fully guaranteed.**Aluminite Pistons and
Aluminite Connecting Rods**Aluminite piston will put six cyl-
inder smoothness into a four cyl-
inder motor; improve a six or
eight, give more power and
quicker get-away. For prices,
state make, model and year.
Piston pins, aluminite connecting
rods and racing motors.For Tractors, these pistons will
greatly increase the efficiency of
the motor and save the bearings.**Power-Plus Cylinder Heads**

For Ford Cars

Keep the Motor Cool

Give More Power and Speed

MotorsComplete stock—new and used
—for all makes of cars. Every
motor in perfect condition—no
junk. We also build and overhaul
motors, both automobile and
aeronautical. Many a good car
proves inefficient, due to motor
trouble. We specialize in motor
work, often changing a four-cyl-
inder to a six, eight or twelve.
Don't discard a car otherwise sat-
isfactory because of motor trou-
ble. Tell us your difficulty and
let us solve the problem quickly,
efficiently and at a reasonable
expense.**Green Engineering Co.**

Dayton, Ohio

Rebuilding and Repairing.

CYLINDER REGRINDING

PISTONS

RINGS

PINS

Largest in Middle West

Our complete records give Per-
manence and Continued Service**BUTLER MFG. CO.**

Established 1897

1115 E. Georgia Indianapolis

CYLINDER S
Reground—We Weld Anything
Fitted with cast iron or light pistons;
leak-proof or plain piston rings.
Best equipped shop in the country.
Quick Service—Reasonable Prices—Gear CuttingSIOUX CITY WELDING & MACHINERY CO.
Dept. MA Sioux City, Iowa**CYLINDER GRINDING**Piston Rings and Wrist Pins made to fit.
All work guaranteed. Prices Right. Prompt
Service.Finest, Most Accurate Machinery
BEST SKILLED MECHANICSModern Auto Repair & Reconstruction Co.
4605-4613 Olive Street, St. Louis, Mo.**CYLINDER GRINDING
WITH HIGHEST GRADE EQUIPMENT**either cast iron pistons and rings or our special light
alloy pistons and rings furnished. Best workmanship.
State make of car in writing. Crankshafts Reground on
special crankshaft grinders—not filed and lapped, but
REGROUND.**STAFFORD MOTOR CO.**

2201-2209 Campbell Ave. Kansas City, Mo.

CYLINDERS REBOREDBy expert mechanics who have been connected
with motor manufacturing. Our experience of
years assures you of only accurate and highest
grade work. New pistons and rings installed,
complete, from \$4.00 a cylinder and up.**GIBBS MACHINE COMPANY**

1202 Locust Street Des Moines, Ia.

CYLINDERS REGROUND\$5 to \$11 per cylinder, including pistons and
rings. Alloy pistons, from \$1.50 to \$3.50 per cyl-
inder, extra. Ford cylinders reground and fitted
with pistons, rings, wrist-pins and bushings
for \$11 per set of four.**Racing Motors a Specialty**

D. R. NOONAN Paris, Illinois

Scored Cylinders RepairedWe use the same pistons. General machine work for
foreign and American cars. All parts duplicated. Weld-
ing of all metals. Manufacturers of Catelein Hose Cou-
pling. Ever-Ready Starters. U. S. Shock Eliminators.
Quick service, satisfaction guaranteed.**ANDRE CATELAIN**

1446-8 Indiana Avenue Chicago, Ill.

CYLINDER GRINDINGHigh grade equipment assures best workman-
ship. Prices reasonable.**MANUFACTURERS OF TRUMP**

MULTIPLE PISTON RINGS

TRUMP MFG. CO.

112 Union St. Crown Point, Ind.

CYLINDERS REGROUNDincluding new pistons and rings. Any size—
\$6 to \$7 per cylinder. All our work guaranteed.
Quick shipments. Let us prove our ability on
your next job.**NEUPERT MFG. COMPANY**

87 Lark Street Buffalo, N. Y.

When Writing to Advertisers, Please Mention Motor Age

Rebuilding and Repairing. Tires.

WE GRIND

Cylinders and fit special heat-treated Pistons. Welding of all kinds of Metals. Gear Cutting of all kinds.

PONDELICK BROS.Largest Mfrs. of Duplicate Auto Parts in U. S.
Leavitt St. & Jackson Blvd. Chicago, Ill.

Rebuilding and Repairing. Tires.

CYLINDERS REBORED

By expert machinists on specially designed machines, insuring absolute accuracy and the highest attainable quality of finish. Special heat-treated extra light new pistons, and re-turned rings fitted without extra charge. Wrist pins to order. Reboring, autos, \$4.50 to \$9.50 per cylinder; special price on Fords.

PARK MACHINE CO.

22 W. 3rd Street St. Paul, Minn.

Tires.

Odd Size Pneumatic Tires

We can ship immediately from stock at attractive prices, odd size pneumatic casings or tubes, such as 31x4 straight side, 32x3 clincher, 34x3½, 35x4, 36x4, 36x3½, 37x4, 37x4½, 37x5½ in quick detachable or straight side. The above will be sold without a mileage guarantee. These are all brand new casings! Standard makes. No seconds! Send your orders or inquiries to

Powell Supply Co.The Pioneer Auto Supply House of the
Central West

2051 Farnam St. Omaha, Neb.

TIRES & TUBESSLIGHTLY USED AND FACTORY REPAIRED
TIRES AND TUBES—QUALITY ABOVE ALL

The **QUALITY** of our tires and tubes is superlative, the **PRICE** cannot be equaled and our **SERVICE** cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	32x4.....	\$ 7.00	\$1.60	35x4½.....	\$ 8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	8.75	1.85
31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3½.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

We will accept junk tires at 5c per pound as part payment on orders, when same are shipped to us by PREPAID express.

LINCOLN TIRE & SUPPLY CO.

1463 S. Michigan Ave. Dept. M. Chicago, Illinois

TIRES**TUBES****SPECIAL SPECIAL SPECIAL**
ECONOMY TO MOTORISTS

Select Your Supply Now for The Season—Slightly Used and Factory Repaired

TIRES and TUBES

A TRIAL WILL CONVINCE YOU

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—**NO JUNK.**

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires

AETNA TIRE & SUPPLY COMPANY

1429 Michigan Avenue

Chicago, Illinois

Special Bargains
in
Slightly Used Tires

The kind that will satisfy all customers.

30x3.....	\$4.00	34x4.....	\$ 8.00
30x3½.....	5.00	34x4½.....	8.25
32x3½.....	6.00	35x4½.....	8.50
31x4.....	6.50	36x4½.....	8.75
32x4.....	7.00	37x4½.....	9.50
33x4.....	7.75	37x5.....	10.00

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

No Mileage Guarantee at the Above Prices

American Tire & Vulcanizing Co.

Phone: Calumet 5170

2136 S. MICHIGAN AVE. CHICAGO, ILL.

STANDARD MAKE USED TIRES

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.50	\$1.35	36x5.....	\$ 9.00	\$2.00
30x3½.....	5.50	1.50	34x4½.....	9.00	2.25
31x3½.....	6.00	1.60	35x4½.....	9.50	2.25
32x3½.....	6.50	1.75	36x4½.....	9.50	2.25
31x4.....	7.25	1.80	37x4½.....	10.50	2.40
32x4.....	7.50	1.85	35x5.....	11.00	2.50
33x4.....	7.75	1.90	36x5.....	11.50	2.50
34x4.....	8.00	1.95	37x5.....	12.00	2.75

No mileage guarantee at these prices

\$1.00 deposit required on each tire ordered.

Balance C. O. D., subject to examination. Also full line of high grade seconds.

SEND FOR PRICES

ARMSTRONG TIRE & VULCANIZING CO.

1336 Michigan Ave. Chicago, Ill.

Branch: 1612 Michigan Ave.

Phones: Calumet 5212, Calumet 2199

Tires.

Tires.

Tires. Magneto and Service Stations.

Special Bargains in New and Used Tires

HIGH GRADE SECONDS

Size	
30x3.....	\$ 7.25
30x3½.....	9.50
32x3½.....	11.25
34x3½.....	13.00

Size	
31x4.....	\$15.25
32x4.....	15.50
33x4.....	16.25
34x4.....	16.50

Size	
35x4.....	\$17.50
36x4.....	18.00
34x4½.....	21.50
35x4½.....	22.50

Size	
36x4½.....	\$23.00
37x4½.....	24.50
35x5.....	26.00
37x5.....	27.50

USED TIRES

Best values ever offered for the money.

Size		Size	
30x3.....	\$4.00	36x4.....	\$8.00
30x3½.....	5.00	34x4½.....	8.25
32x3½.....	5.75	35x4½.....	8.50
31x4.....	6.25	36x4½.....	8.65
32x4.....	6.50	37x4½.....	9.00
33x4.....	7.50	35x5.....	9.00
34x4.....	7.50	37x5.....	10.00
35x4.....	7.75		

37x4½ Ribbed Tread Cord Tires.....\$40.00

Add 10% more for non-skid.

All goods shipped promptly. \$1 deposit required with each tire ordered. Balance C. O. D., subject to examination, at the above prices without a guarantee. Specify whether new or used, clincher or straight side.

ROYAL TIRE & SUPPLY COMPANY

1461 Michigan Avenue
CHICAGO, ILL.
Phone Calumet 2553

BILTRITE Rebuilt Tires That ARE REBUILT

After the tread is worn out 60 per cent of the tire's material value is still in the tire. It should be utilized. It should be rebuilt by the BILTRITE process. This consists of testing the tire, buffing the tread from the carcass, supplying a reinforcing fabric, then building up as is done in the standard tire factories. Such corporations as the New York Telephone Company, the Shredded Wheat Company, and the Green, Fuel Economizer Company are practicing BILTRITE economy. Why don't you?

Size	You Supply Casing	We Supply Casing	Size	You Supply Casing	We Supply Casing
30x3.....	\$ 9.10	\$10.60	33x4.....	\$17.25	\$19.00
30x3½.....	11.25	12.75	34x4.....	17.75	19.50
32x3½.....	13.50	15.00	35x4.....	18.75	20.50
34x3½.....	15.50	17.00	36x4.....	19.25	21.00
31x4.....	13.50	15.25	33x4½.....	22.50	25.00
32x4.....	16.75	18.50	34x4½.....	25.25	28.00

Specify style of rim. Send \$1.00 deposit (orders to office; casings to factory). Tires sent promptly C. O. D. BILTRITE tires carry no mileage guarantee—but they are warranted to give satisfaction and will be adjusted on a basis of mileage given.

THE CONDEX TIRE COMPANY, Inc.

Factory: 685-A Eleventh Avenue

NEW YORK CITY

Office: 1416 Broadway

HIGH GRADE QUALITY TIRES & TUBES

Manufacturer's Surplus Stock of Factory Seconds

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3.....	\$ 8.35	\$ 8.75	\$1.80	34x4.....	\$17.55	\$18.45	\$3.40
30x3.....	7.95	8.55	1.95	36x4.....	18.95	19.60	3.65
30x3½.....	10.35	10.95	2.30	34x4½.....	22.60	24.90	4.15
32x3½.....	11.65	12.90	2.40	35x4½.....	23.60	25.10	4.30
31x4.....	16.15	16.90	3.00	36x4½.....	23.90	26.60	4.40
32x4.....	16.55	17.30	3.05	37x5.....	30.75	31.45	5.30
33x4.....	17.10	17.85	3.25	35x5.....	29.85	31.30	....

We warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee

5% FOR CASH IN FULL WITH ORDER.

Save this discount, as upon arrival of shipment you still have the privilege of returning any items which do not come up to expectations for full cash refund.

STERLING TIRE & SUPPLY HOUSE

1355 Michigan Avenue

CHICAGO, ILL.

Slightly Used Tires STANDARD MAKES—NO JUNK

Size	Tire	Size	Tire
30x3.....	\$4.00	36x4.....	\$ 8.25
30x3½.....	4.70	34x4½.....	8.25
32x3½.....	5.70	35x4½.....	8.25
31x4.....	6.20	36x4½.....	8.50
32x4.....	6.75	37x4½.....	9.25
33x4.....	7.00	35x5.....	9.00
34x4.....	7.50	36x5.....	9.00
35x4.....	8.00	37x5.....	10.00

—No mileage guarantee at above prices—
Specify whether Q. D. Clincher or Straight Side
\$1.00 Deposit Required on Each Order, Balance C. O. D., Subject to Examination

Delco Tire and Vulcanizing Company

1545 S. Mich. Ave. Ph. Calumet 4858 Chicago

TIRES

Factory Blemished ALL STANDARD MAKES

No mileage guarantee.

Order from Us and Save Money
Money Back if Not Satisfied

Size	Plain	Skid	Non-Skid	Size	Plain	Skid	Non-Skid
30x3.....	\$ 8.25	\$ 9.25		34x4.....	\$18.50	\$20.50	
30x3½.....	10.75	12.50		34x4½.....	23.50	26.00	
32x3½.....	12.25	13.50		35x4½.....	25.00	27.50	
31x4.....	15.80	18.50		36x4½.....	26.00	28.50	
32x4.....	16.75	19.25		35x5.....	29.00	31.00	
33x4.....	17.75	19.75		37x5.....	30.00	32.50	

Other sizes in proportion.

Special Prices on Tubes Tires Sent Anywhere
10% with order, balance C. O. D., subject to inspection
THE OHIO GUARANTEE TIRE & RUBBER CO.

5510 Euclid Ave. CLEVELAND, OHIO

(Dealers wanted)

HIGH GRADE TIRES AND TUBES

Factory Seconds, Unguaranteed, at Interesting Prices. Also complete line of Firsts.
Write Us Your Needs

ACORN TIRE & REPAIR CO.
1547 So. Michigan Ave. CHICAGO, ILL.

SECONDS AT 50% OFF

Size	Non-Skid Only—No Mileage Guarantee	Size	Non-Skid Only—No Mileage Guarantee
30x3.....	\$ 9.25	31x4.....	\$18.30
30x3½.....	11.75	32x4.....	18.70
31x3½.....	12.65	33x4.....	19.60
32x3½.....	13.75	34x4.....	20.05
		35x5.....	32.65

10% Deposit Required, Balance C. O. D.
LAKESIDE RUBBER COMPANY
1412 Michigan Avenue Chicago, Illinois

\$100,000.00 STOCK

STANDARD MAKE FACTORY
SECONDS AT GREATLY REDUCED PRICES

Tires & Tubes

SPECIAL PRICES TO DEALERS ON
QUANTITY ORDERS

No definite mileage guarantee, but reasonable adjustments cheerfully made

SERLIN TIRE CO.

1300-1302 Michigan Ave. Chicago

IF IT'S ELECTRICAL WE CAN FIX IT

ANY STARTING, LIGHTING,
IGNITION SYSTEM

WE OFFICIALLY REPRESENT

BERLING MAGNETO CONNECTICUT
PHILBRIN BENDIX DRIVES
WESTINGHOUSE JESCO (Jones Starter)
K. W. IGNITION DYNETO
HEINZE SPRINGFIELD FORD STARTERS
VAN SICKLEN SPEEDOMETERS
WALTHAM SPEEDOMETERS
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LET THE MAN WHO KNOWS
HANDLE YOUR REPAIR WORK

Arthur Jones Electric Co.

Established 1903

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Everything Electrical

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BRANCH 3911 Sheridan Rd. Phone—Lakeview 7706
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Our shop handles automobile factory work for the electrical manufacturers. Trained factory experts to repair and test your equipment. Complete parts stock insures prompt service.

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Auto Electric & Service Corporation
11-13-15-17-19 Selden Avenue

Magnetos and Service Stations.
Radiator and Lamp Repairing.

Expert Repair Service

ON EVERY KNOWN
MAGNETO IGNITION SYSTEM
GENERATOR STARTING MOTOR
All Repairs Promptly Executed
All orders for repair parts shipped the day
orders are received
AMERICA'S MOST COMPLETE
IGNITION, LIGHTING AND STARTING
INSTITUTION
PELLET MAGNETO CO.
Twenty-fifth and Wabash Avenue.
CHICAGO

SECOND HAND ELECTRIC MOTORS
We make a specialty of, and have the largest
stock of **SECOND HAND electric MOTORS**
and **GENERATORS** in America, and buy and
sell, rent, exchange and repair electrical ma-
chinery of all kinds.
GREGORY ELECTRIC COMPANY
16th and Lincoln Streets CHICAGO

ELECTRIC REPAIR SERVICE
We represent eight factories
ELECTRICAL TESTING CO.
PEORIA, ILL.

Pioneer RADIATOR Manufacturers
Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your
Radiator down East when you can ship to us; save time, expense, freight, money, and be assured
of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.
TODD MANUFACTURING CO. Minneapolis, Minn.

RADIATORS
OUR HONEYCOMB RADIATOR embodies
STRENGTH COOLING POWER NEATNESS
Repairing and recoring old radiators. Everything in the
automobile sheet metal line
We solicit your inquiries
ILLINOIS AUTO SHEET METAL WORKS
Veteran Radiator Experts of the West
3220 S. Michigan Ave. CHICAGO, ILL.

RADIATORS
Get a Square Tube Radiator, 25% greater
water capacity. Made for any car. New,
guaranteed cores placed in old radiators. We
also manufacture hoods, fenders, tanks and
pans, and do guaranteed repair work. Prompt
and satisfactory service.
CHICAGO MANUFACTURING CO.
1458-60-62-64 Michigan Avenue • Chicago, Ill.

RADIATORS REPAIRED PROPERLY
Anybody may attempt to repair
your radiator. To succeed is another matter.
SEND IT TO DENVER
W. H. NEVEU, "The Radiator Man"
Largest in the West. 1327-35 Broadway, Denver, Colo.

RADIATORS
We repair Radiators of all kinds—Any
Make or Any Style
MITCHELL RADIATOR REPAIR COMPANY
933 Ft. Wayne Ave. Indiana
Indianapolis Buy and Sell Used Radiators

Radiators Properly Repaired
Do not spoil your radiator by trying to stop leaks with
material that will eventually cause you to buy a new
one. Send it to us, we will repair it and make it good
as new.
Quick Service
THE AUTO RADIATOR CO.
401 Lincoln Way, East South Bend, Indiana

Radiator and Lamp Repairing.
Patents and Patent Attorneys. Mailing Lists.

Good as New—Looks Like New
Briskin-repaired Radiators do not leak—that's guar-
anteed! And they're finished up—enameled and polished
to look as good as they really are. This means cus-
tomer-satisfaction to the repairman. More money and
quicker service, too.

BRISKIN MANUFACTURING CO.
Radiator Repair Experts
541 N. Capitol Ave., Indianapolis

W(RIGHT) RADIATORS
Have stood the test for years—most durable and efficient.
Get the best at less cost than others. Don't order until
you send for our prices and illustrations of construc-
tion. Honeycomb and Bridge Fin Type (tubular). All
standard makes in stock. Exceptionally low prices on
Fords. Dealers' discount.

WRIGHT COOLER AND HOOD CO.
1253 Michigan Avenue Chicago, Ill.

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Patent Attorney
Formerly member Examining Corps, U. S.
Patent Office, McGill Building, Washington,
D. C.
Pamphlet of instruction sent upon request.

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Write for How to Obtain a Patent, list of Patent
Buyers and Inventions Wanted. \$1,000,000 in
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plete and accurate record of over 200,000
cars. Loose leaf. Supplements for
three year period. Dealers, Garages,
etc.—Guaranteed Lists.

W. H. BOONE COMPANY
Mailing Lists—Addressing—Multigraphing
627 First Avenue, No.
MINNEAPOLIS MINNESOTA

AUTO MAILING LIST
44,755 Auto dealers, U. S. ...\$75.00 or \$2.50 per M
7,949 Ford Dealers, U. S. ... 18.50 or 3.00 per M
5,519 Truck dealers, U. S. ... 12.00 or 3.00 per M
(Showing make of truck handled)
150,000 Truck owners 7.00 per M
5,400 Truck owners in Chi-
ago 15.00 or 3.50 per M
46,943 Garage, U. S. 75.00 or 2.50 per M
55,967 Auto Supplies, Retail,
U. S. 90.00 or 2.50 per M
45,054 Repair Shops 75.00 or 2.50 per M
404 Auto Mfrs. 3.00
73,674 Auto Dealers, Garages, Supplies and Re-
pairs in one list, no
duplicates125.00 or 2.50 per M
1,502 Auto Supply Jobbers... 5.00
Complete list auto owners and Ford owners, \$2.50 per
M. Further particulars.
Trade Circular Addressing Co.
166 W. Adams Street (Franklin 1182) Chicago

Strictly Authentic. Up-to-Date
AUTO MAILING LISTS
Any classification or combination from any state.
All lists guaranteed. Lowest prices. Just let us know
what you want and we will quote prices. Write for
complete price list.
Monthly Supplements
C. W. BYRD COMPANY
713 First National Bank Building
Durham North Carolina

Miscellaneous.
Cars and Garages for Sale. Schools.

WE PAY CASH FOR PLATINUM SCRAP

Mercury, contact points, old false teeth. Send us what
you have for disposal, no matter how much or how little,
and we will remit full market value by return mail.
THE MUTUAL SMELTING & REFINING CO.
54 South Front St. COLUMBUS, OHIO

Samuel L. Winternitz & Company
AUCTIONEERS
Largest Liquidators of Motor Plants
FIRST NAT. BANK BLDG. CHICAGO, ILL.

\$125.00
TAKES 40 H. P. NORTHWAY UNIT POWER PLANT
Good running order with Delco Starter and
Generator
ROBINSON & ROWLAND
1436 Wabash Avenue Chicago, Ill.

FOR SALE
Well established garage and automobile sup-
ply house in town of twenty thousand, with
Dodge agency for one county. Apply
Box 212 Chickasha, Okla.

FOR SALE
Good paying garage business with the only
Standard Oil Service Station in a city of
13,000. Must sell at once. Cheap. For further
particulars, write
J. T. JELLEY GARAGE
Canton Illinois

FOR SALE
One forty H. P. Overland Motor in good con-
dition with new cylinders and one Model K 30
Chalmers motor just overhauled with new
cylinder block and rings.
JASPER MACHINE WORKS
Jasper Alabama

FREE BOOKLET
"How to Succeed in the Automobile Business"
on application. \$40,000 equipment—eight in-
structors—actual work repairing and driving—
day and evening classes.
**GREER COLLEGE OF AUTOMOBILE,
TRACTOR & AEROPLANE ENGINEERING**
1456 Wabash Avenue Chicago, Illinois

MANY FIRMS
Have built up a lucrative business
by telling of their facilities and
service in these sections.

WHY NOT YOU?
Write us what you have to sell and
to whom you want to sell, as we are
always glad to tell of our ability to
serve you and our facilities for co-
operating with you.

CLASSIFIED DEPARTMENT
MOTOR AGE
Mallers Building CHICAGO

Help Wanted.

WANTED
A good mechanic that is not in the
first draft
GILSTRAP BROS.
Gillett Wyoming

MOTOR TRUCK SALESMEN

wanted for several good territories by large motor truck manufacturer in Wisconsin. Want only men with successful selling records for establishing dealers and agencies. In writing, state experience, territory preferred and proposition expected.

Box E-857

c/o MOTOR AGE

Situations Wanted.

SITUATION WANTED RATES

30c per line; minimum price, \$1.20

Payment in advance required. Compute six words to the line. Forms close Friday noon each week.

WANT A CHAUFFEUR? I'M READY FOR the job. Experienced. Good repairman. First Class References. Prefer private family. M. CALO, 96 S. Leonard Street, WATERBURY, CONNECTICUT.

Contract Work.

CONTRACT WORK

Advertisers in this section have facilities at their disposal to take on additional work on contract. Automobile specialties of all kinds manufactured on contract basis. Special machinery, press work, auto machine work, foundry work, automatic screw machine work.

METAL STAMPINGS, JIGS, DIES, GAGES, SPECIAL TOOLS, ETC.

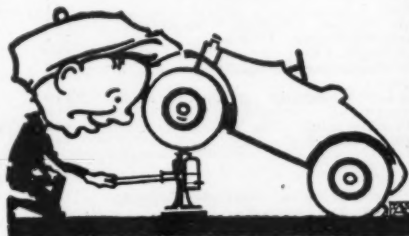
KRASBERG MFG. CO.

536 LAKE SHORE DRIVE

Opp. Municipal Pier

CHICAGO

*Easily put in place;
easily worked when there.*

**"THE EASY LIFTER"**

Smooth — sure —
quick-acting.

You'll like the

Hartford
AUTO JACK

Its army of users say
it's

*"The Best Jack
Money Can Buy"*

Edward V. Hartford, Inc.

146 Morgan Street
JERSEY CITY, N. J.

155 motor car builders and
motor truck builders use
ECLIPSE
BENDIX DRIVE
as standard equipment

AN
AUTOMATIC
GEAR
TRANSMISSION
for
ELECTRIC
STARTERS

Manufactured by
ECLIPSE MACHINE CO.
Elmira, N.Y.

KNOX CARBURETOR

Saves 10% to 30% F.V.

A True Automatic Multiple-Jet Carburetor, with Only One Moving Part. Self-adjusting to any weather, altitude, or motor conditions. Unconditionally guaranteed. Write for full particulars.

Manufacturers of KNOX Motors, Carburetors, Launches

CAMDEN ANCHOR-ROCKLAND MACHINE CO., Camden, Me.

BETHLEHEM MOTOR TRUCKS*"DEPENDABLE DELIVERY"***1 1/4 TON CHASSIS, \$1295****2 1/4 TON CHASSIS, \$1915**

All F. O. B. Allentown

Built to dominate the truck business in your territory—backed by the Bethlehem guarantee and a strong national advertising campaign. Is your territory covered?
BETHLEHEM MOTORS CORP., Allentown, Pennsylvania

**GUARANTEE VISIBLE PUMPS**

Fast service, full measure and perfectly filtered gasoline, assure dealers the constant patronage of satisfied customers.

Write for the Pump Book

Guarantee Liquid Measure Company
Farmers Bank Building, **PITTSBURGH, PA.**



Inner armor
for auto-
mobile tires.
Prevent

INSYDE TYRES

punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

AMERICAN ACCESSORIES CO. 250 Gulow St., Cincinnati, Ohio

CONTRACT WORK DEPARTMENT

Page 133 This Issue

You will save time and money
by consulting this Department

**ZENITH CARBURETOR**

KNOWN the world over as
the *zenith* of carburetor
efficiency. A long list of Ameri-
can builders of cars, trucks and
aeroplanes believe this simple,
plain tube device to be the best
insurance for permanent carburetor
satisfaction.

Zenith Carburetor Co.

New York Detroit, U.S.A. Chicago

A Perfect Balanced Truck
SANFORD
 Worm Gear Drive
 2½, 3½ and 5 Ton



5-Ton Sanford, stake
 rack body, owned by Joseph
 Caydiga, Iron Works, Brooklyn, N. Y.

The Sanford is built by men with years of experience in knowing what the public wants and expects in motor trucks.

The Sanford is a thoroughly standardized truck built of materials best suited to stand the tremendous strains of modern business.

The Sanford stays sold and earns repeat orders because the makers recognize that service to be real must be willing, intelligent and prompt.

Immediate Deliveries
SANFORD MOTOR TRUCK CO.
 SYRACUSE, N. Y.

*The Hollenden
 Cleveland*

"Home of The Cleveland Auto Club"

EVERY phase of personal service at the Hollenden is characterized by tactfulness, promptness and courtesy.

Many of the employes have served Hollenden patrons for years—an unusual condition in hotel employment. Uniformly excellent service is the result.

EUROPEAN PLAN—WITH BATH:

For One Person.. \$2 to \$5
 For Two Persons.. \$3 to \$6
 With Twin Beds.. \$4 to \$6
 Suites at Various Prices

Ample garage facilities immediately adjacent

Official A. A. A. Hotel

Index to the

Adams and Elting Company.....	113
Ahlberg Bearing Company.....	112
Amazon Rubber Company.....	55
American Accessories Company.....	133
American Window Glass Company.....	108
Anderson Electric Specialty Company.....	120
Atwater-Kent Manufacturing Company.....	119
Automobile Blue Book Publishing Company.....	88-89
Automotive Industries.....	115

Barkoot, K. G.....	120
Bearings Company of America.....	117
Bearings Service Company.....	66-67
Benford Manufacturing Company.....	68-69
Bergie National Spark Plug Company.....	114
Bergougnan Tire Company.....	95
Bethlehem Motors Corporation.....	133
Billings and Spencer Company.....	53
Black and Decker Manufacturing Company.....	122
Blake, S. M., Manufacturing and Engineering Co.....	116
Blood Brothers Machine Company.....	117
Bosch Magneto Company.....	121
Bound Brook Oil-less Bearing Company.....	116
Britson Manufacturing Company.....	114
Brown-Lipe-Chapin Company.....	120
Brunner Manufacturing Company.....	109
Buda Company.....	84
Budrick Rubber Company.....	116
Buell Manufacturing Company.....	115
Burd High Compression Ring Company.....	120
Bryne, Kingston and Company.....	119

Camden-Anchor Rockland Machine Company.....	133
Cassidy, Edward A., Company.....	72
Century Storage Battery Company.....	116
Champion Spark Plug Company.....	Front Cover
Chase, L. C., Company.....	119
Clearing House.....	123-133
Commerce Motor Car Company.....	112
Continental Motors Corporation.....	117
Curtis Pneumatic Machinery Company.....	120

Defender Auto Lock Company.....	115
Detroit Accessories Corporation.....	121
Disco Electric Manufacturing Company.....	103
Dixon, Joseph, Crucible Company.....	91
Dunn Counterbalance Company.....	111
Dyneto Electric Company.....	118

Eclipse Machine Company.....	133
Eclipse Manufacturing Company.....	70
Econ-O-Kleen Fuel Company.....	110
Elsemann Magneto Company.....	90
Electric Auto-Lite Corporation.....	122
Elgin Motor Car Corporation.....	120

Firestone Tire and Rubber Company.....	122
Fulton Motor Truck Company.....	54

Gabriel Manufacturing Company.....	87
Gasket Supply Company.....	120
General Gas Electric Company.....	82
Globe Manufacturing Company.....	108
Goodrich-Lenhardt Manufacturing Company.....	101
Gordon, J. P., Company.....	121
Guarantee Liquid Measure Company.....	133
Gurney Ball Bearing Company.....	1

Halladay, L. P., Company.....	109
Haney, J. H., and Company.....	111
Hartford, Edward V., Incorporated.....	133
Haywood Tire and Equipment Company.....	110
Higgins Spring and Axle Company.....	116
Hill Pump Valve Company.....	121
Hill-Smith Metal Goods Company.....	117
Hollenden Hotel.....	134
Homestead Engineering Company.....	118
Hoover Steel Ball Company.....	112

Imperial Oil Company.....	115
---------------------------	-----

J and D Tire Company.....	65
Jenkins Vulcan Spring Company.....	74
Jewell Electric Instrument Company.....	108
Johnson Company.....	97
Johnson, S. C., and Son.....	2d Cover

Advertisements

K. B. C. Company.....	122
Kellogg Manufacturing Company.....	79
Kimball Tire Case Manufacturing Company.....	121
Kimball Tire and Rubber Company.....	122
Kissel Motor Car Company.....	118

Lalley Electro-Lighting Corporation.....	50
Lane Motor Truck Company.....	71
Liberty Accessories Corporation.....	56
Lockwood-Ash Motor Company.....	75

MacBeth Evans Glass Company.....	117
Marathon Tire and Rubber Company.....	83
Mason Tire and Rubber Company.....	76
Maxwell Motor Company.....	57-64-80
McDaniel, Leo, Rubber Company.....	118
Mercer Automobile Company.....	118
Merchant, M. H.....	117
Metal Specialties Manufacturing Company.....	136
Miles Manufacturing Company.....	119
Miller Rubber Company.....	Back Cover
Mitchell Motors Company.....	86
Moltrup Steel Products Company.....	118
Moon Motor Car Company.....	73
Mutty, L. J., Company.....	113

Nash Motors Company.....	4
National Wire Wheel Works.....	120
New Departure Manufacturing Company.....	2
New York and New Jersey Lubricant Company.....	114
Norma Company of America.....	3
Norwalk Tire and Rubber Company.....	96

Ohio Grease Company.....	112
Oneida Motor Truck Company.....	135

Paco Manufacturing Company.....	114
Phillips-Brinton Company.....	122
Phillips Engineering Company.....	119
Piston Ring Company.....	118
Pia-Safe Company.....	121

Rayfield Carburetor.....	52
Richards-Wilcox Manufacturing Company.....	135
Russell Manufacturing Company.....	116

St. Louis Electrical Works.....	122
Sanford Motor Truck Company.....	134
Schrader's Son, A.....	113
Selden Truck Sales Company.....	114
Shaler, C. A., Company.....	93
Sheldon Axle and Spring Company.....	105
Smith, L. E., Glass Company.....	115
Sparks-Withington Coupany.....	117
Splittorf Electrical Company.....	94
Standard Motor Truck Company.....	119
Standard Parts Company.....	98-99
Stephens Motor Branch of Moline Plow Co.....	51
Stevens and Company.....	116
Stewart-Warner Speedometer Corporation.....	81
Storm Manufacturing Company.....	118
Stromberg Motor Devices Company.....	116
Sunderman Corporation.....	100

Tillotson Manufacturing Company.....	85
Timken-Detroit Axle Company.....	92
Traffic Motor Truck Company.....	77
Triangle Motor Truck Company.....	78

U. P. C. Book Company.....	104
U. S. Ball Bearing Manufacturing Company.....	117
U. S. Light and Heat Corporation.....	114
Universal Tool Company.....	122

Vanderpool Company.....	121
Vellie Motors Corporation.....	49

Waukesha Motor Company.....	119
Webber, P. H., Company.....	102
Weston Electric Instrument Company.....	119
Wheeler-Schebler Carburetor Company.....	114
Winton Company.....	121
Wire Wheel Corporation of America.....	3d Cover
Wonder Sales Company.....	114

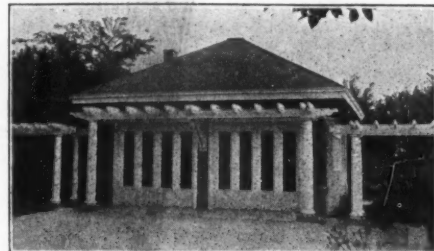
Zenith Carburetor Company.....	133
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Classy Appearance —

Another advantage secured by garage builders who hang their doors on



Slidetite (Patented) Garage Door Hardware



Double entrance garage equipped with "Slidetite" Hardware

Besides operating the doors easily and positively, preventing them from sagging or slamming against the auto, and keeping out cold and storm—Slidetite hardware produces architectural harmony and distinction—takes away that barn door effect—and makes possible a distinctive and ornamental doorway.

Sold by the best hardware trade everywhere.

Richards-Wilcox Manufacturing Co.

SAN FRANCISCO
LOS ANGELES
NEW YORK
CHICAGO

AURORA, ILLINOIS, U.S.A.

Richards-Wilcox Canadian Co., Ltd. London, Ont.

"A hanger for any door that slides"

PHILADELPHIA
MINNEAPOLIS
BOSTON
ST. LOUIS

ONEIDA TRUCKS

POWER to meet all conditions of road and load—ruggedness to stand the slam-bang of short haul service—durability to keep its running costs low. All these are found in the

ONEIDA TRUCK

to a degree that marks it as one of America's great trucks.

Dealers are writing and wiring to see if their territory is still open. Prompt deliveries!

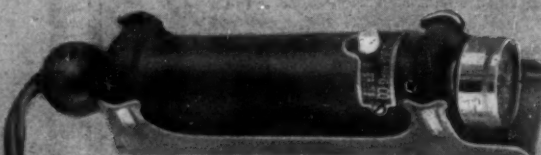
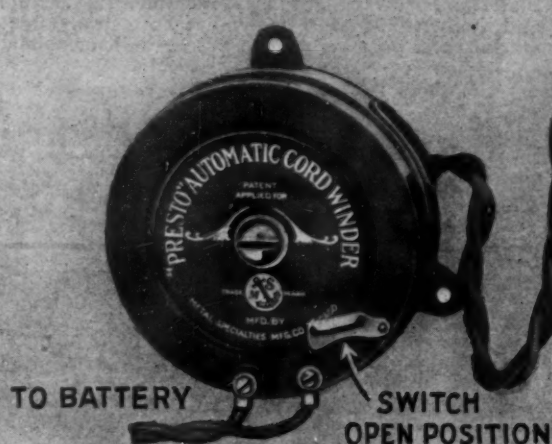
1, 1½, 2, 3½ and 5 ton models
All Worm Drive

ONEIDA MOTOR TRUCK CO.
Green Bay, Wisconsin



Presto Products

Are America's Foremost Specialties



PRESTO Products are referred to everywhere as leaders in automobile specialties. They are asked for and demanded by motorists who know the reputation that stands back of this line of specialties.

Two articles from this famous line of accessories are illustrated here.

The Presto Brace is strong as a bull and built scientifically like a trussed steel structure. Stops vibration—avoids sagging of running boards and prevents their breaking away from fenders—prevents broken springs—prevents uneven strain—holds drive shaft in position—holds all mechanical parts in alignment—equalizes spring action—easily installed; no holes to drill; no mechanic necessary.

Price only \$3.50 in U. S. A., except west of Rockies, \$4.00. In Canada, \$6.00.

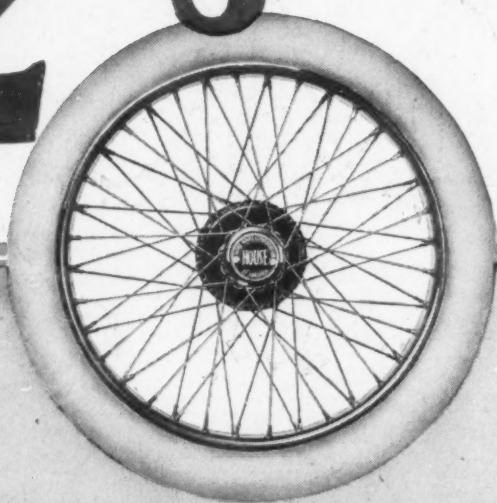
Presto Electric Cigar Lighters fill a universally acknowledged need. Permit a cigar to be lighted when the car is going at full speed. Extremely popular with all classes of motorists. Several styles and sizes.

Dealers—Send for our catalog of over 100 useful motor car accessories. The most comprehensive line manufactured.

Metal Specialties Mfg. Co.
338-352 N. Kedzie Ave., Chicago

Eastern Branch: 16-24 W. 61st St., New York
Western Branch: 149 New Montgomery St.,
San Francisco.

2 Big Opportunities



HOUSE for Fords

List price for set of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, one hub dust cover for spare wheel, \$60. White, black, red. Colors optional.

\$60

SERVICE and SALES AGENCY

Established dealers can secure the Wire Wheel Service and Sales Agency where territory is vacant.

The large demand for wire wheels is rapidly growing larger. Owners of cars of all makes are realizing the safety, comfort, easy handling and tire-and-fuel-saving, in addition to the familiar advantages of attractive appearance and quick tire change.

In Ordering Wheels or Parts

Always specify make, model and year of car. Also size and type of tire, whether straight side or clincher, with diameter of hub cap at threads. This information should accompany every order for any part.

For dealer proposition address

WIRE WHEEL CORPORATION of AMERICA

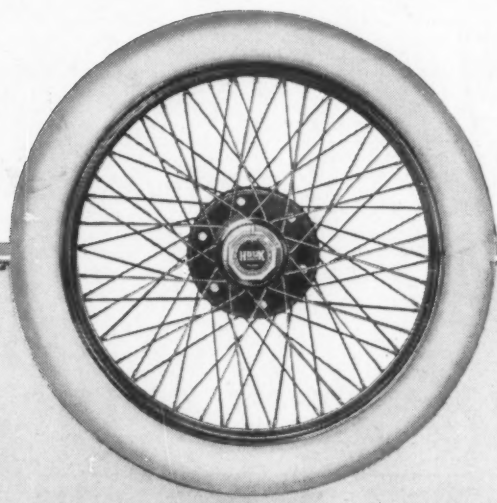
(Successors to Houk Manufacturing Co.)

Factories: BUFFALO, N. Y., and SPRINGFIELD, MASS.

Direct Factory Branches and Service Stations:

NEW YORK, 835 Eleventh Avenue at 57th Street
PHILADELPHIA, 328 North Broad Street
LOS ANGELES, 1216 South Grand Avenue

CHICAGO, 23rd and Indiana Avenue
DETROIT, 16 Davenport Street
SAN FRANCISCO, 1690 Pine Street



HOUK QUICK CHANGE FOR

Name of Car	Model	Year	Name of Car	Model	Year
Abbott	6-44, 6-60	1917	King	EE	1917
Anderson	6-60	1917	Kissel	100 point 6	1917
Anderson Elec.	1917-8		Kissel	12	1917
Ap's'n R'dapl.	6-60	1917	Kilne	6-38	1917
Apperson	6 & 8	1917	Lexington	6-O	1917
Auburn		1917	Liberty	10-A	1917
Baker R&L.	G-A	1917	Locomobile	R7&M7	1917
Barley	Roamer	1917	Lozier	82 1914 84	1917
Biddle	D	1917	Madison	6-40	1917
Bour Davis	17	1917	McFarlan	127	1917
Briscoe	4-48, B-24	1917	Mar. Handley	6-60	1917
Bulck Various Models			Marmion	34	1917
Cadillac	55	1917	Maxwell	25	1917
Case	40	1917	Mercer	22-73	1917
Chalmers	35C	1917	Milburn		1917
Chandler	6-40or32B	1917	Mitchell	C-42, D-40	1917
Chevrolet	8 cyl.	1917	Moline	Knight	1917
Cole	8 cyl.	1917	Moon	6-43, 6-66	1917
Columbia	D	1917	Murray	70-T	1917
Crow Elkhart	C-E-35	1917	National	6 & 12 cyl.	1917
Cunningham	V	1917	Oakland	50, 34	1917
Daniels	A	1917	Olds	45, 37	1917
Darling		1917	Overland	All Models	1917
Davis	Light 6	1917	Owen Magnetic	O-36	1917
Disbrow	Special	1917	Packard	225 & 235	1917
Dixie Flyer		1917	Paige	H-6 & K-6	1917
Dodge		1917	Paige	G-6 & J-6	1917
Dorris	6 cyl.	1917	Pathfinder	3-B	1917
Dort	9 & 6	1917	Patterson	6-45	1917
Economy	4 cyl.	1917	Peerless		1917
Economy	8 cyl.	1917	Pierce	6-48, 6-66	1917
Elcar	D. E. F.	1917	Pilot	6-45	1917
Elgin		1917	Premier	6-B	1917
Empire	50	1917	Pullman	4-24	1917
Empire	70-70 A	1917	Regal	J. F.	1917
Enger	Twin Unit	1917	Reo	R	1917
Erie	33 & 34	1917	Roamer		1917
F. I. A. T.	55	1917	Ross	C	1917
Franklin	Series 9	1917	Saxon	S-4	1917
Grant	K	1917	Scripps	4 cyl., 8 cyl.	1917
H. A. L.	21	1917	Singer		1917
Harroun		1917	Standard	E & E	1917
Haynes	6 cyl. 36	1917	Stanley	Steamer	1917
Haynes	12 cyl. 40	1917	Stearns	32-33-Sk-8	1917
Hallier	186	1917	Studebaker	SF&ED	1917
Hudson	Super Six	1917	Stutz	R	1917
Hupp	N	1917	Velle	28	1917
Interstate		1917	Vim		1917
Jackson	349	1917	Westcott	S-17, U-50	1917
Jeffery	472 & 671	1917	White	16 valve 4 cyl.	1917
Jordan	60	1917	Winton	22-A	1917

Additional Models

In addition to list we can supply sets of Houk wire wheels for the majority of these makes of cars of older models

*"Uniform Tires
are winning hosts
of users"*



The Biggest Factor in Tires Today Is Miller Uniform Mileage

This is what motorists long have wanted—tires that run the same under like conditions. For who could tell when he bought a tire whether it would go 5,000 miles or fail at 1,000?

Miller Uniform Tires bring a revolution. 99 in 100 outrun standard guarantees.

Such uniformity has been the aim of all tire makers for years. Miller achieved it by training tire builders to be champions.

Now motorists are reading all about these Uniform Millers and they are turning to Miller Dealers at a surprising rate.

Opportunities are open for aggressive

dealers in numerous localities. Write at once for our attractive proposition and a free copy of the Miller Analysis of Tire Trade Conditions. A remarkable survey of the tire business resulting from months of field investigation. Send for a copy while they last.

The Miller Rubber Co., Dept. A-28, Akron, O.

Makers of
Miller Red and
Gray Inner Tubes
—The Team-Mates
of Uniform Tires

Miller  **Tires**
GEARED-TO-THE-ROAD

Miller Tire Acces-
sories are the life-
savers of old tires
and the "first-aid"
to injured ones.



